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STUDIES IN VOCATIONAL DISEASES

THE EFFECT OF GAS-HEATED APPLIANCES UPON THE AIR OF WORKSHOPS

By

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EFFECT OF GAS-HEATED APPLIANCES UPON THE AIR OF WORKSHOPS.

By Charles Weisman, *Sanitary Chemist*,

United States Public Health Service.

On page 15 of Public Health Bulletin No. 71,[1] reporting a general investigation of the health of garment workers in New York City, made on request of the Joint Board of Sanitary Control of the Cloak, Suit and Skirt, and Dress and Shirt Waist Industries of that city, it was stated that a certain part of the investigation, relating to the effect of gas-heated appliances on the air of workshops, was still in progress. The present bulletin sets forth the results of this study. The work was done by Sanitary Chemist Charles Weisman, of the Public Health Service, under the general direction of Surg. J. W. Schereschewsky, in charge of studies of industrial hygiene for the service.

Scope of the Investigation.—The investigation included:

(1) Analyses of air samples taken in shops of the garment industry with reference to the amount of carbon monoxide gas present, and studies of the condition of gas-heated appliances.

(2) Laboratory examinations of the gaseous combustion products of various kinds of gas-heated pressing irons.

(3) Tests of the permeability to gas of the walls of various kinds of flexible gas tubing, and of the security against leakage of gas connections.

(4) The hygienic significance of the presence of small amounts of carbon monoxide in the air of confined inhabited places.

Acknowledgments.—Acknowledgments are gratefully made to the faculty of the Cornell University Medical College, who gave the use of their chemical laboratories; to Dr. George M. Price, director of the Joint Board of Sanitary Control of the Cloak, Suit, and Skirt

[1] Studies in Vocational Diseases, (1) The Health of Garment Workers, by J. W. Schereschewsky; (2) The Hygienic Conditions of Illumination in Workshops of the Women's Garment Industry, by J. W. Schereschewsky and D. H. Tuck.

and Dress and Waist Industries, for his cooperation and assistance; to the Consolidated Gas Co., of New York City, and their engineers, Mr. O. H. Fogg and Mr. J. M. Haralson, for the loan of pieces of apparatus and their cooperation in many other ways; to the American Meter Co. and the Connolly Iron Sponge & Governor Co., for the loan of various appliances; and to the following manufacturers of gas irons for the loan of sample gas irons: American Pressing Iron Co., William M. Crane Co., Ensor & Co., New York Pressing Appliance Co., Rosenbaum Manufacturing Co., Sunshine-Jasper Co., and Stockwell & Co.

I. EXAMINATION OF AIR AND GAS-HEATED APPLIANCES IN WORKSHOPS.

METHODS FOR THE DETERMINATION OF CARBON MONOXIDE.

Speaking generally, methods for determining the presence of carbon monoxide may be divided into two groups, the physiological and the chemical. The physiological method is based on the fact that carbon monoxide is absorbed by the blood, forming a stable compound (carbon monoxyhemoglobin [1]).

The chemical methods may be classified as absorption and oxidation methods. The former depends on the absorption of the carbon monoxide by a solution of cuprous chloride in hydrochloric acid or ammonia and on the measurement of the resulting contraction in volume of the gas mixture. This method is suitable only for the determination of fairly large amounts of carbon monoxide. Oxidation methods depend upon the oxidation of carbon monoxide to carbon dioxide, the amount of carbon monoxide present being determined either directly by measuring the carbon dioxide produced, or indirectly by the amount of the oxidizing agent which has been reduced. Among the various substances which have been used as oxidizing agents are copper oxide, mercuric oxide, palladious chloride, and iodine pentoxide.[2] In the case of iodine pentoxide, carbon monoxide may be estimated from either the amount of iodine liberated or the amount of carbon dioxide formed, use being made of Ditte's (11) observation in 1870 that iodine pentoxide, when heated to between 150 and 200° C., is decomposed by carbon monoxide as follows:

$$I_2O_5+5CO=I_2+5CO_2.$$

The oxidation method, with the use of iodine pentoxide, was selected for testing the air of workshops.

---

[1] Although both this compound and oxyhemoglobin give two absorption bands in the spectrum, carbon monoxyhemoglobin is not reduced by such reagents as ferrous sulphate or ammonium sulphide, while oxyhemoglobin is reduced.

[2] For a full review of the development of the iodine pentoxide method for carbon-monoxide determination, the reader is referred to Appendix A.

DESCRIPTION OF METHODS OF SAMPLING AND ANALYSIS.

Two and one-half liter flasks were used for taking air samples. The flask was filled with water in the shop where the sample was to be taken, then inverted, the water being allowed to flow out. A rubber stopper greased with vaseline was used to seal the bottle after the sample had been taken. As a rule, two air samples were secured in each shop, one about 2 inches from the lighted gas iron, the other in the same room, near a window, as far away as possible from the source of air contamination.

The apparatus for analysis of the sample consisted of the following parts:[1]

1. A train of absorption bulbs (C) containing concentrated sulphuric acid, to dry the air and to remove a portion of any unsaturated hydrocarbons present.
2. A train of bulbs (D) containing fuming sulphuric acid to remove the remainder of such unsaturated hydrocarbons.
3. A train of bulbs (E) containing potassium hydroxide solution (25 per cent) to remove acid vapors from the fuming sulphuric acid and carbon dioxide from the gas sample.
4. A train of bulbs (F) containing concentrated sulphuric acid to remove moisture.
5. A U tube (G) containing small pieces of caustic potash to remove any vapors from the sulphuric acid.
6. A U tube (H) fused to (G) and containing iodine pentoxide immersed in a bath of cottonseed oil heated to 150° C.
7. A train of bulbs (I) containing 5 c. c. of 10 per cent solution of potassium iodide, to which was added 0.5 c. c. of a 0.5 per cent solution of soluble starch, to absorb the liberated iodine.

The bottle containing the air sample was placed on the floor, the stopper removed, and a stopper perforated by glass tubes connected with the apparatus immediately inserted. The air sample was driven through the apparatus by allowing the water from bottle A to flow into air sample bottle B. The flow of water was started by gently blowing into the side tube at the upper part of bottle A. The rate of flow was regulated by the pinch cock at *r*, and was such as to require about $1\frac{3}{4}$ hours to displace the air in a 2,500 c. c. bottle. After the gas in the air sample bottle had been displaced by water, the stopcock at S was closed, the bulb I, containing the liberated iodine, was disconnected, and after the entire contents of the bulb had been blown into a small beaker, the liquid was titrated with N/1000 sodium thiosulphate until the disappearance of the iodine blue-starch color. Each c. c. of N/1000 sodium thiosulphate was equivalent to 1 c. c. of carbon monoxide at 0° and 760 mm. pressure.

As iodine pentoxide is decomposed by water, organic matter, and high heat, great care had to be exercised in the use of the reagent,

[1] See fig. 1.

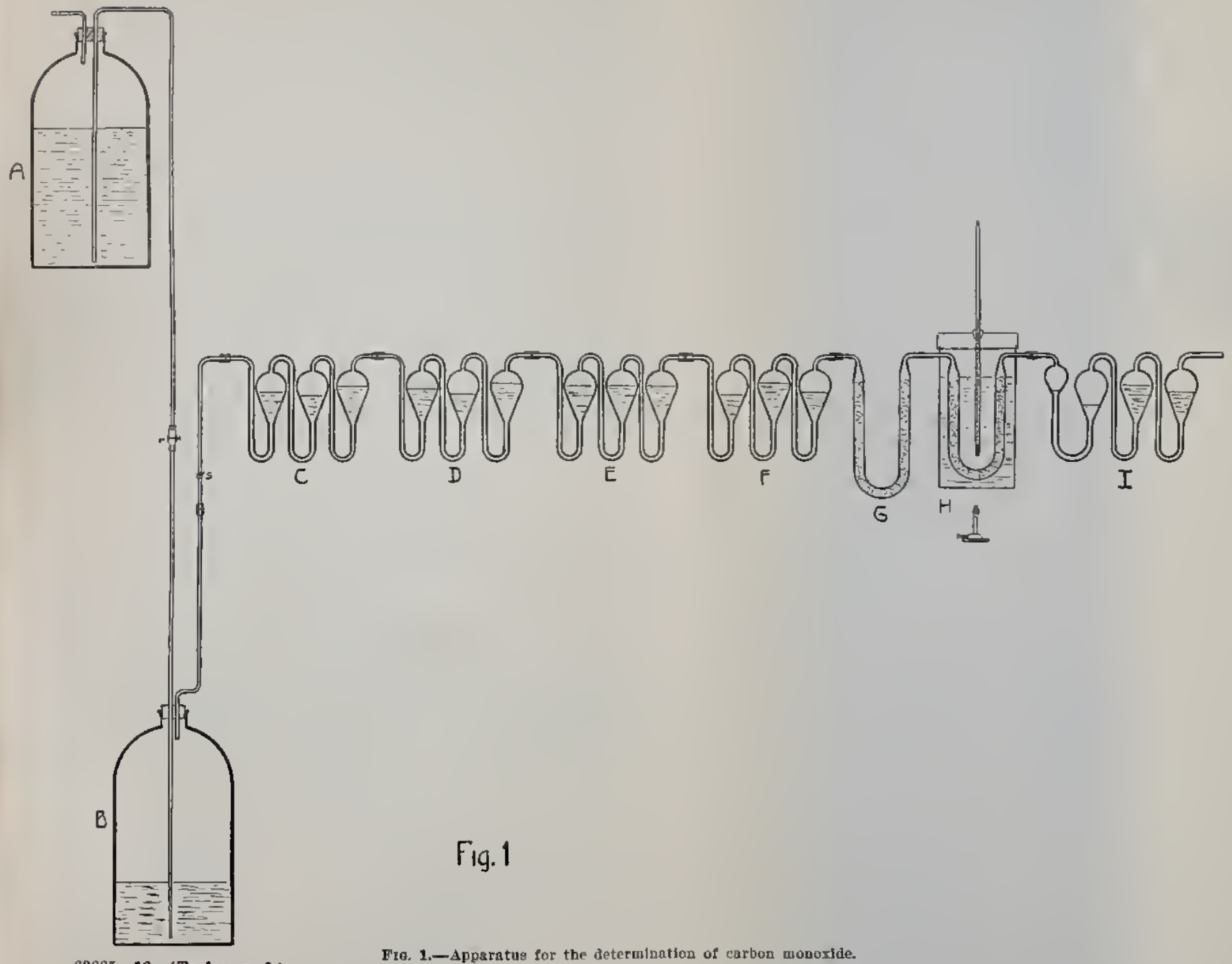

Fig. 1.—Apparatus for the determination of carbon monoxide.

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(1) to get a pure reagent kept in glass-stoppered bottles, and (2) to keep out organic matter or other impurities in filling the U tubes. After being powdered, the iodine pentoxide was put into the U tube with alternate layers of glass wool, each about three-eighths of an inch in depth, in order to prevent possible caking and clogging of the tube.[1] A safeguard used to prevent the introduction of organic matter from the room or of vapors from the oil bath was to fuse the U tube containing the iodine pentoxide to the U tube containing the pieces of caustic potash.[2]

Before using the iodine pentoxide for an analysis it was heated to 200° C. and purified air passed through the apparatus until no "free iodine" was given off. This often required a day, sometimes much longer. At the termination of an analysis either purified air was passed through the apparatus until the residual gas had been swept through and any free iodine carried over from the iodine pentoxide U tube into the absorption bulb, or, if laboratory air was used, a blank analysis was made on an amount of air equivalent to that used to clear the apparatus, the CO value for the blank being deducted from the total. Usually about 1 liter of air was sufficient to clear the apparatus.

RESULTS OF AIR TESTS IN SHOPS.[3]

CARBON-MONOXIDE RESULTS.

In the course of the present investigation air samples were taken from 244 shops. Of these, 29, or 11.8 per cent, were found to

[1] The capacity of the U tube was about 9 grams of iodine pentoxide.

[2] In this process the hot flame from the blast lamp must be kept as far away as possible from the part of the tube containing the iodine pentoxide.

[3] In an investigation of the ventilation of cloak and suit shops for the Joint Board of Sanitary Control of New York City in 1911, Dr. C. T. Graham-Rogers (51), chief medical factory inspector of the New York State Department of Labor, reported the results of analyses of air samples for carbon monoxide. He used the palladious chloride method (52), air samples being taken near the breathing level of the pressers. From an analysis of his work the following table was constructed:

Graham-Rogers' results of carbon monoxide analyses in shops of the garment industry.

Number of shops.	Amount of carbon monoxide—	
	In 10,000 parts of air.	In 1,000,000 parts of air.
30	Less than ½ part	Less than 50 parts.
9	½ to 1 part	50 to 100 parts.
34	1 to 2 parts	100 to 200 parts.
9	2 parts	200 parts.
1	Over 2 parts	Over 200 parts.
83		

From these figures it is found that 47 per cent of the shops gave a carbon monoxide content of less than 100 parts per million parts of air and that 53 per cent of the shops contained over 100 parts per million parts of air. These results would indicate that pressers may be subject to chronic carbon monoxide poisoning. Records of previous investigations in which iodine pentoxide was used will be found in Appendix A.

have present over 100 parts of carbon monoxide per million parts of air.[1] The following table gives the amounts of carbon monoxide present in the air in these 29 shops:

TABLE 1.—*Carbon monoxide present in the air of 29 shops of the women's garment trade.*

Number of shops.	Parts of carbon monoxide per million parts of air.	
9		100–200
6		200–300
5		300–400
3		400–500
3		500–1,000
3		1,000–1,500
29	Average.	325

From the foregoing table it is seen that the average for these 29 shops was 325 parts of carbon monoxide per million parts of air. These amounts range from 105 parts to 1,431 parts of carbon monoxide.

Of the samples of air taken in these shops near windows at points as far as possible from sources of contamination, the amounts of carbon monoxide ranged from 2 to 39.6 parts per million parts of air, or an average carbon monoxide content of 11.8 parts per million parts of air.

In 55 shops the carbon monoxide ranged from 25 to 100 parts per million parts of air, or an average of 47.3 parts. The corresponding window samples from these shops ranged from 2.2 to 32.3 parts, or an average of 11.4 parts. The average amount of carbon monoxide for the 244 shops from samples taken near pressing irons was 55.4 parts and from the window samples was 7.4 parts per million parts of air.

In considering the results of these air tests it should be remembered that this investigation was carried out during the open-window season, when almost all of the windows of the shops were kept open. In spite of this fact, it is evident from the foregoing that the air in the vicinity of pressing irons presented a fairly high degree of contamination with carbon monoxide as compared to the air in the best ventilated part of the shop. The supposition is reasonable that during the winter season, with all windows closed, the conditions would be considerably worse.

MORNING AND AFTERNOON SAMPLES COMPARED.

Of the 244 shops inspected, air samples were taken in the morning in 165 shops, or in 67.6 per cent of the total number, and in the after-

[1] Samples taken near pressing iron.

noon in 79 shops, or in 32.3 per cent of the total. Of the 165 samples taken in the morning, 20 samples, or 12 per cent, gave over 100 parts of carbon monoxide per million parts of air, and 53 samples, or 32 per cent, gave over 25 parts of carbon monoxide per million parts of air. Of the 29 air samples that showed over 100 parts of carbon monoxide per million parts of air, 69 per cent were morning samples and 31 per cent were afternoon samples. Of the 55 air samples that ranged between 25 to 100 parts of carbon monoxide per million parts of air, 33, or 60 per cent, were morning samples and 22, or 40 per cent, were afternoon samples.

As ventilating conditions in the various shops were not uniform, no conclusion could be drawn from a comparison of the carbon-monoxide content in air of shops in the morning to that of the afternoon. Were such conditions uniform, one would expect to find a greater carbon-monoxide content in the afternoon, when products of combustion of the gas irons or of the leakage from gas appliances had an opportunity to accumulate in the air of the shops.

VENTILATION.

No mechanical system of ventilation was used in any of the shops visited, window ventilation being relied upon. Electric fans were provided in 6 per cent of the shops visited, but, of these places, less than half used them. While windows are generally open during the warm weather, with the approach of cold weather it is the general practice to keep them shut. According to statements of the workers in the shops, the windows are kept closed in cold weather chiefly because of inadequate heating provisions and the workers' fear of drafts.

GAS ODOR.

An odor of gas was perceptible in 93 establishments, or 38 per cent of the total number inspected. Out of the 29 shops where the amount of carbon monoxide was found to be over 100 parts per million parts of air, a gas odor was noticeable in 27. Out of 55 shops where the amount of carbon monoxide ranged from 25 to 100 parts per million parts of air, a gas odor was noticeable in 40 cases, or in over 72 per cent of the total.[1]

CONDITION OF GAS-HEATED APPLIANCES.

Gas tubing and gas-tubing connections.—In connection with gas-heated pressing irons, rubber tubing only was used in 188 shops, or

[1] It must be remembered that the shops were inspected when there was every opportunity for the gas odors to diffuse to the outer air through open windows or doors. It should also be remembered that persons working constantly in an ill-smelling atmosphere soon become so accustomed to the odor as not to perceive it, especially when the odor at first is only slightly perceptible and the rate of increase in the amount of the gas escape is small. It is also a well-known fact that persons suffering with nasal catarrh may often be unable to detect a gas odor even if it be strong.

in 77 per cent of the total number inspected, while flexible metal tubing was used exclusively in 23 shops, or in 9 per cent of the total. About 11 per cent of the shops used both rubber and flexible metal tubing. Flexible metal tubing was therefore used in about 20 per cent of the shops. Out of 112 shops where "blower" irons were used, 18 shops, or 16 per cent. used flexible metal tubing in connection with these irons.

Obviously defective rubber tubing was found in 52 shops of the 244 inspected, or in 21.3 per cent of the total. In 36 of these 52 cases defective rubber tubing was the defective condition found; in the rest of the shops, in addition to defective rubber tubing, there were poor gas tubing connections, defective gas irons, and defective flexible metal tubing.

Defective metal tubing was found in 16 shops or in 6.5 per cent of the entire number of shops examined. These 16 shops included 4 shops where flexible metal tubing was the only defective condition found; the other 12 shops had in addition to defective flexible metal tubing, other defective conditions, such as defective rubber tubing, poor gas tubing connections, and defective gas irons.

Defective rubber or flexible metal tubing was found in 66 shops, or in 27 per cent of the total number examined; i. e., over 1 out of every 4 shops inspected was using some kind of defective gas tubing.

Poor gas tubing connections were found in 17 cases, or in about 7 per cent of the total number of shops inspected.

Gas irons.—Out of 244 shops examined, 122, or 50 per cent, used ordinary gas irons only, 102 shops, or 41.8 per cent, used "blower" irons exclusively, i. e., an iron heated by a mixture of gas with air under pressure. Six shops, or 2.4 per cent, used electric irons only, while the rest used miscellaneous irons.

Defective gas irons were found in 21 shops, or 8.6 per cent of the total number. In 10 of these shops the use of defective gas irons was the only defective condition found; in the other shops, in addition to this defect, there were found defective gas tubing and poor gas-tubing connections.

REINSPECTIONS.

That the presence of abnormal amounts of carbon monoxide polluting the air of shops in the garment industry and of the defective sanitary conditions which accompany the discharge of poisonous gas into the air was not limited to the particular day of the inspection, and air sampling of the premises was shown by reinspections, which indicated that bad-air conditions which occur on a given day often recur day after day.

Of 10 shops in which the carbon monoxide on the first inspection was over 100 parts per million parts of air, 5 shops on reinspection were also found to have over 100 parts of carbon monoxide. Of these five cases two were found where the carbon monoxide on the reinspection was more than twice as high as on the original inspection.

CONCLUSIONS.

It is evident from the foregoing that the air of workshops in the women's garment trades is often contaminated by carbon monoxide gas. The sources of this contamination are: (*a*) Defective utilization of gas in pressing irons; (*b*) undue permeability of the walls of gas tubes to illuminating gas; (*c*) leakage because of faulty connections; and (*d*) the use of grossly defective tubing. These sources of contamination are considered in Sections II and III of this report.

II. STUDIES OF COMBUSTION PRODUCTS OF GAS-HEATED PRESSING IRONS.

METHOD OF TESTING COMBUSTION PRODUCTS.

Industrial pressing irons for tailoring purposes may be divided into two general classes: (1) Gas-heated irons and (2) electrically heated irons. The former may be classified as (*a*) those burning gas with air at atmospheric pressure and (*b*) those burning gas with the air under pressure.

GAS IRONS AT ATMOSPHERIC PRESSURE.

The first type of gas irons examined were those burning gas with air at atmospheric pressure. The gas iron to be tested, approximately 16 pounds in weight, was connected to the gas supply, and the flames were adjusted so that 6 cubic feet of gas were consumed per hour. An interval of 20 minutes was allowed for the iron to get heated, and then a sample of the gaseous combustion products was taken. The tube through which the combustion products were aspirated was of hard glass, about 6 mm. in diameter, shaped like a poker, with the short end about 6 cm. in length, and provided with a number of small openings (about 1¼ mm. in diameter) in the shorter side, which terminated in a sealed end. The open end of the longer side of this aspirating tube was connected by means of a piece of rubber tubing to a regular glass sampling tube, which had been filled with water. To take a sample of the gaseous combustion products, the short end of the aspirating tube was inserted directly over the opening in the upper part of the gas iron where combustion products escape into the outer air. The gas-sampling tube, containing water, was held in a vertical position, the stopcocks opened, permitting the water to flow out, and the combustion products from directly over the gas iron ports were drawn into the sampling tube. To displace the air originally present in the aspirating tube, the rubber connections, and the ends of the sampling tube, the lower end

of the sampling tube was connected with an aspirator and more of the combustion products drawn through until all the air originally present in the connections had been swept out. The stopcocks of the sampling tube were then closed, and the gas transferred to a gas burette partially filled with water. The burette was shaken up well so as to saturate the water with the gas. This process was continued until a sufficient amount of water saturated with the gas to be examined had been collected to enable final filling of the sampling tube, the gas burette, and the leveling tube. A sample of the gas combustion products from the sampling tube was now transferred to a measuring burette and the carbon monoxide determined in a Hempel pipette in the usual way by absorption in a fresh ammoniacal solution of cuprous chloride. Before absorbing the carbon monoxide in the cuprous chloride solution the carbon dioxide was removed by treatment with caustic potash, the illuminants were absorbed in fuming sulphuric acid, and the oxygen was absorbed in an alkaline solution of pyrogallic acid.

"BLOWER IRONS."

As the "blower" gas irons have no openings from which it would be convenient to take a sample of the combustion products, the entire gas iron was placed upon a brick inside of a galvanized-iron pail about 11 inches in diameter and 12 inches in height, provided with a suitable cover, and after a suitable interval a sample taken from the air in the pail. The cover of the pail was provided with two holes, one just large enough for the entrance of the rubber tubing connected with the gas iron, the other sufficiently large to permit entrance of the aspirating tube previously described. As used in practice, a blower iron of about 16 pounds in weight consumes from $5\frac{1}{2}$ to 7 cubic feet of gas per hour. For the sake of comparison with the ordinary gas iron, the flame of the blower iron was regulated so as to consume 6 cubic feet of gas per hour. To begin the sampling process, the blower iron, after being lighted and adjusted, was placed inside the pail and covered, one of the holes in the cover being left open to permit the air originally present to be expelled. After an interval of 20 minutes allowed for accumulation of the combustion products of the blower iron, the aspirator tube was inserted in the cover of the pail, connected with the sampling tube, and a sample of the combustion products collected as in the case of an ordinary gas iron.[1]

[1] With the exception of the use of a glass tube gas aspirator instead of an iron tube aspirator, the method of sampling used was that followed by the Consolidated Gas Co. of New York.

RESULTS OF ANAYLSIS.[1]

CUPROUS CHLORIDE METHOD.

The following tables show the results of the analysis of the combustion products of the gas irons investigated:

TABLE 2.—*Analyses of combustion products of ordinary gas-heated pressing irons.*

Iron No.	CO_2.	Illuminants.	O.	CO.	Average CO.	Iron No.	CO_2	Illuminants.	O.	CO.	Average CO.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
1	11.4	0	7.9	0	.....	5	12	0	3	1.2	.....
	11.7	0	7.8	0	.....		5.4	0	11.4	.4	.....
	7.4	0	9.2	0	.....		7.1	0	8.4	.6	.....
	12	0	4.5	0	.....		5.8	0	10.2	.7	.....
	10.8	0	6.0	0	.....		8.0	0	6.8	.3	0.73
	11.7	0	4.6	0	0	6	11.6	0	2.6	.6	.....
2	13.0	0	3.0	0	.....		7.0	0	9.6	.0	.....
	11.2	0	4.6	0	.....		6.4	0	10.0	.0	.....
	15.8	0	4.0	1.6	.....		6.6	0.15	7.3	1.8	.....
	11.6	0	2.6	.6	.....		5.4	.10	8.3	1.6	.....
	8.2	0	7.8	0	.....		6.8	0	9.6	.8	.80
	10.3	0	4.4	.2	.....	7	8.6	0	6.4	2.0	.....
	11.4	0	7.9	0	.....		7.0	0	7.2	1.8	.....
	6.8	0	9.0	0	.....		8.9	0	7.9	.2	.....
	12.0	0	8.6	.1	.27		6.1	0	11.5	.2	.....
3	6.2	0	10.4	.4	.....		7.4	0	9	.3	.....
	7.8	0	9.2	.6	.....		10.0	0	4	.8	.....
	8.4	0	9	.3	.....		10.4	0	2.6	1.4	.....
	10.2	0	6	.2	.....		9.2	0	2.9	1.1	.97
4	6.0	0	5.0	.5	.....	8	6.4	0	10.8	.7	.....
	7.2	0	8.4	.7	.....		5.4	0	10.6	.6	.....
	7.8	0	9.1	.4	.53		4.2	0	12.4	1.7	1.00
5	11.5	0	1.9	1.2	.....						

[1] Meyer (32), in reporting the results of analyses of the combustion products of blower irons, found from 93 to 110 parts of carbon monoxide per million parts of air, and when the air pressure of the blower irons was diminished found from 540 parts to 710 parts of carbon monoxide per million parts of air. The method of analysis pursued by this investigator is not mentioned. The following table was constructed from data given by him:

Carbon monoxide in the combustion products of pressing irons (according to Meyer).

Experimenter.	Kind of pressing iron.	Source of sample.	Carbon monoxide parts per million parts of air.
Weyl	Charcoal iron	Height of head	1,900–2,500.
Meyer	.....do	Directly above iron	1,350–2,010.
	.....do	Height of head	760–910.
	Iron heated with a specially prepared substance claimed by the manufacturer to be odorless.	Directly above iron	1,240–1,680.
	.....do	Height of head	580–610.
	Iron heated by gasoline and compressed air.	Directly over iron	78.
	Illuminating gas and compressed air	....do	93–110.
	Illuminating gas and compressed air, but diminished air pressure.	.....do	540–710.
	Iron heated by Dawson gas and compressed air.	....do	Average, 110.
	Same iron, but using illuminating gas and compressed air.	....do	Average, 90.

TABLE 3.—*Analyses of combustion products of "blower" or gas and compressed-air pressing irons.*

Iron No.	Carbon dioxide.	Illuminants.	Oxygen.	Carbon monoxide.	Iron No.	Carbon dioxide.	Illuminants.	Oxygen.	Carbon monoxide.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
1	14.2	0	2.5	0	3	14.0	0	5.2	0
	11.2	0	5.8	0		9.0	0	7.6	0
	11.5	0	6.4	0		9.1	0	8.7	0
	13.0	0	2.4	0		11.4	0	8	0
	11.3	0	5.2	0	4	11.0	0	5.4	0
	14.1	0	4.8	0		9.6	0	5	0
2	12.3	0	2.8	0		12.2	0	4.6	0
	14.4	0	6.2	0		13.1	0	4.9	0
	11.6	0	5.6	0		12.6	0	4.5	0
	10.2	0	6.4	0					
	12.6	0	5.6	0					

In considering the figures in the preceding tables it should be noted that they represent the composition of the undiluted products as they leave the gas iron; these gas products would naturally become greatly diluted as they diffuse further and further into the atmosphere of the room.

From the tables it is seen that the percentages of carbon monoxide given off from atmospheric pressing-gas irons varied from 0 to 2 per cent. It should be borne in mind, however, that the limit of sensitiveness of the method of analysis used was 0.1 per cent. Anything less than 0.1 per cent was therefore reported as 0. The average for 46 tests made on 8 different makes of gas irons was 0.57 per cent of carbon monoxide, and the average for each make of iron ranged from 0 to 1 per cent of carbon monoxide.

In the case of blower irons, analysis of combustion products by the above method showed no carbon monoxide. Twenty tests were made on four different makes of blower irons.[1]

IODINE PENTOXIDE METHOD.

Samples of combustion products from the improved type of atmospheric gas iron described as type number 3 on page 20, and from a blower iron, both of which had given no carbon monoxide with the use of the Hempel apparatus and the cuprous chloride reagent, when examined by the iodine pentoxide method showed the presence of small amounts of carbon monoxide, which, however, were not sufficient to produce symptoms of chronic poisoning. A sample of gaseous combustion products was taken in the usual manner, as if for a determination with the Hempel apparatus. One hundred c. c. of this sample was then diluted with

[1] Here, too, it must be remembered that the limit of sensitiveness with the method used was 0.1 per cent; anything less than this amount being reported as 0.

air to 2,500 c. c., and the carbon monoxide in the mixture was determined by the iodine pentoxide method. The following table shows the results obtained with the improved type of atmospheric iron (see fig. 10) and with the blower iron:

TABLE 4.—*Comparative analyses by cuprous chloride method and by iodine pentoxide method of the combustion products of gas irons.*

	Carbon monoxide by cuprous chloride method.	Carbon monoxide by iodine pentoxide method.
	Per cent.	
Improved type of atmospheric iron (for description see p. 20).	0.0	72 parts of carbon monoxide per million parts of air.
	0.0	90 parts of carbon monoxide per million parts of air.
Blower iron	0.0	64 parts of carbon monoxide per million parts of air.
	0.0	48 parts of carbon monoxide per million parts of air.

GAS-HEATED PRESSING IRONS.

DESCRIPTION.

A brief description of gas-heated pressing irons follows:

Gas irons using air at atmospheric pressure.—The burner of an ordinary gas-heated iron consists of a metal tube or hollow bar supplied with a number of gas ports. It is inclosed in the body of the iron, supported at a fixed distance above the base, and supplied with a mixture of gas and air through a mixing chamber located at the gas intake of the iron. The air-mixing chamber

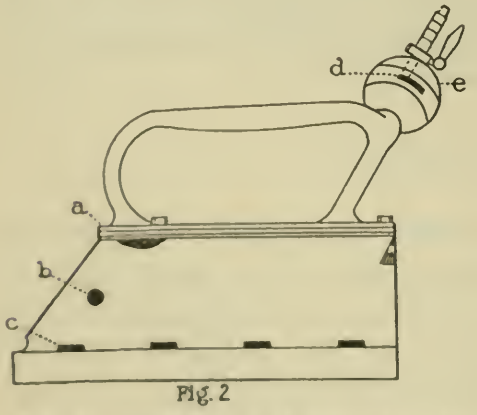

Fig. 2

FIG. 2.—Elevation of atmospheric gas iron, Type I.

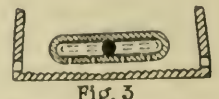
Fig. 3

FIG. 3.—Cross-section of base.

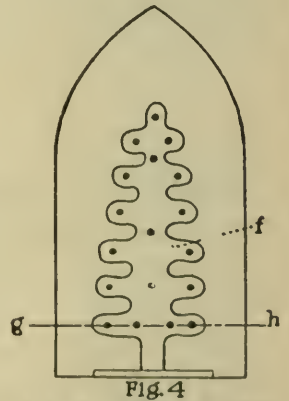

Fig. 4

FIG. 4.—Plan of base.

is connected to the gas supply by means of a gas cock and gas hose. Secondary air is generally supplied to the burner through ports drilled in the side walls near the bottom of the iron. The products of combustion escape to the outer air mainly through openings directly beneath the upper plate, to which the handle is attached, but also through a few ports in the upper part of the wall.

The various gas irons on the market differ somewhat from one another in the construction, shape, size, and arrangement of the various component parts.

Several types of irons used in the garment industr in New York City are here described.

(1) The first and oldest type of gas iron has a base consisting of a hollow metallic casting containing the gas burner. This casting is provided with draft openings (fig. 2, a, b, c) in its side walls near the bottom and with openings for the exit of combustion products near the upper wall. The burner (fig. 4) is a hollow web-shaped metallic casting fitting within the base casting and is provided on its under surface with a number of jet perforations (g–h), through which the flames issuing from the ignited gas are projected directly against the bottom plate of the base casting. The web shape of the burner is intended to radiate and distribute the heat uniformly. A mixing chamber is provided wherein the cold air and gas are mixed. The intent of the chamber is to supply cold air to the burner for combustion at a constant rate and to prevent the escape of mixed hot air and gas through the mixing chamber into the atmosphere. This mixing chamber (fig. 2, e) is screwed into the rear end of the tube leading to the burner, is open at the top, and forms a part integral with the handle plate. A number of air ports are provided around the base of the mixing chamber. Its upper end carries a bridge wall having a threaded aperture to which an ordinary gas cock on the end of a gas supply is secured. Projecting downward from the cock into the mixing chamber is a nozzle which terminates at about the level of or a little below the air ports.

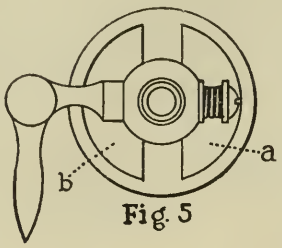

Fig. 5

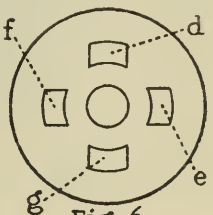

Fig. 6

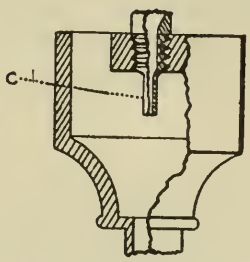

Fig. 7

FIGS 5 and 6.—Cross-section of mixing chambers of atmospheric gas irons.

FIG. 7.—Cross-section of gas nozzle.

In order to prevent the escape of hot air and gas from the burner to the mixing chamber, there is provided a reservoir which is closed on all sides excepting for a small opening for the passage of gas from the mixing chamber to this reservoir and another to the burner. The reservoir is formed relatively large at its top and gradually decreases in diameter toward its base, where it leads into the tube communicating with the burner. In spite of the desire of the designers of this iron to have a mixing chamber which would not permit gas to escape to the outer air, the odor of escaping gas at the openings of the mixing chamber was often noticed. Further, the provision for the admission of secondary air is not quite adequate.

(2) The next type of gas iron (figs. 8 and 9) has at its base, and running lengthwise in the combustion chamber, a slot which extends from the heel to the toe of the iron and forms a recess into which the burner (fig. 9, g) is slightly depressed. The burner consists of a metallic tube supported front and rear and held securely in place by a stove bolt. A number of ports suitably spaced for the issuing gas are drilled horizontally on both sides of the burner tube. The latter is so located in the base that the burner ports are elevated sufficiently above the bottom of the combustion chamber to provide for any increase in the length of the flames caused by an increase in the gas pressure.

Secondary air is supplied through a number of drilled openings or slots (fig. 8, c) on each side of the iron. These slots run crosswise from the side walls

through the base and open into the central slot referred to above. A further supply of secondary air is derived from two larger drilled openings in the rear wall of the iron equally spaced on each side of the burner and on the same level. Provision for the escape of the products of combustion is made by the fluting of the upper edge of each side wall (fig. 9, h). The mixing tube is screwed into the rear end of the burner. The gas connection is a corrugated nozzle with a nonadjustable primary air intake, which consists of a number of drilled openings. In this type of gas iron no gas odor was detected issuing from the ports in the air-mixing chamber.

(3) The third type of iron here described consists of four separate parts: The base, the burner and mixing chamber, the side-wall frame, and the plate and handle. (Figs. 10, 11, 12.) The base consists of a casting provided with a continuous opening on each side of the iron, thus forming two slots leading to a central slot which runs lengthwise in the base of the iron. Through these slots on each side of the iron secondary air is admitted. The bar burner consists of a casting provided with a number of openings drilled on the bottom for the issuing gas jets. The burner is placed so as to have the flames impinge at a distance from the base of the iron sufficient to prevent cooling of the flames and to allow for the extension of the length of the flames due to a possible increase

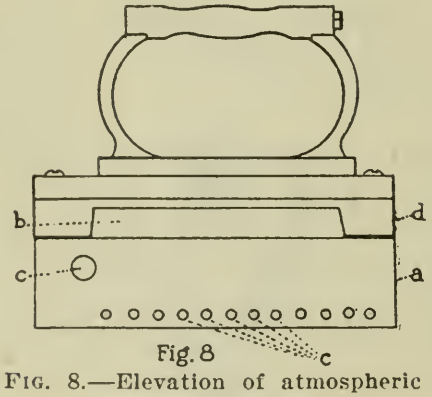

FIG. 8.—Elevation of atmospheric gas iron, Type 2.

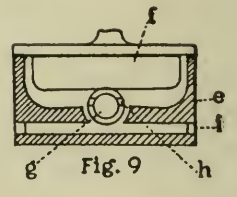

FIG. 9.—Cross-section of above.

in gas pressure. The products of combustion pass around the outer side of the bar burner and up along the walls of the iron to the outer air, through the space between the wall and the handle plate.

The air-mixing tube is screwed to the rear of the burner and is provided with a sufficient number of openings for the admission of primary air. With this type of iron no gas odor was detected at the openings of the air-mixing chamber. All of the parts of the iron are held together by one nut at the top of the handle plate, thus rendering it easy to separate or to reassemble the parts of the iron.

Blower irons.—A "blower" iron is one heated by gas with the aid of air forced in under pressure. It is practically an iron heated by a blast lamp. In a Bunsen burner about one-third of the total amount of air, the so-called primary air, necessary to burn the gas completely is supplied through the air openings and the remainder is supplied as secondary air at the point where the gas is burned. In a "blower" iron all the air necessary for complete combustion is supplied to the gas before the latter is burned. This results in better combustion and, in addition, a higher flame temperature is secured. The iron proper is usually formed of a metal casting with a heat chamber and a burner process communicating with it. The burner consists of a hollow cylinder or supply pipe for the passage of gas and is provided with a gas aperture which

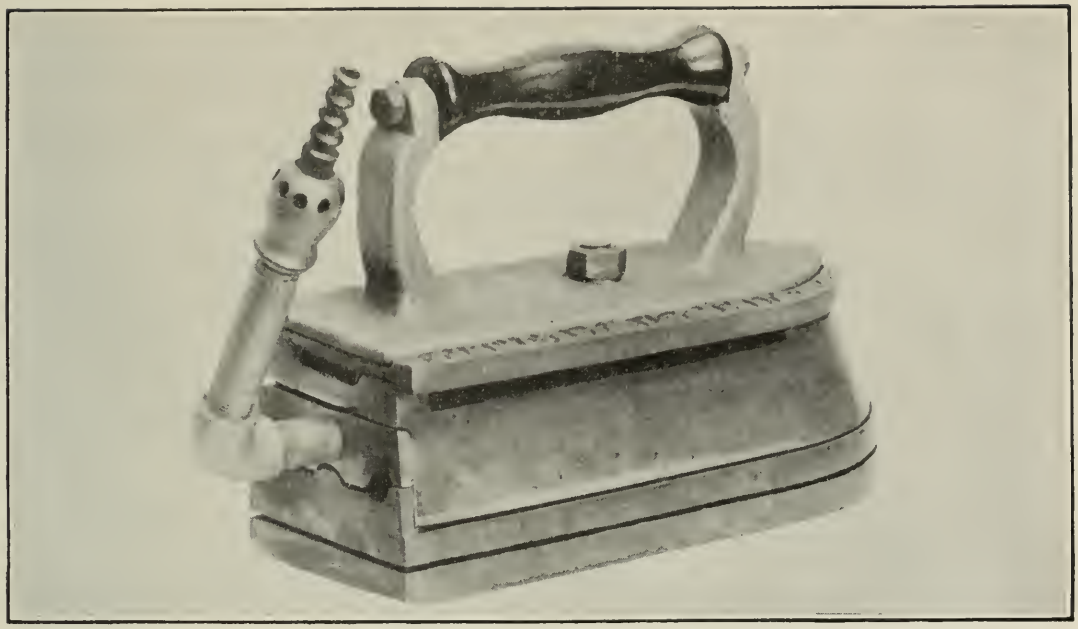

FIG. 10.—ATMOSPHERIC GAS IRON, TYPE 3, GENERAL VIEW.

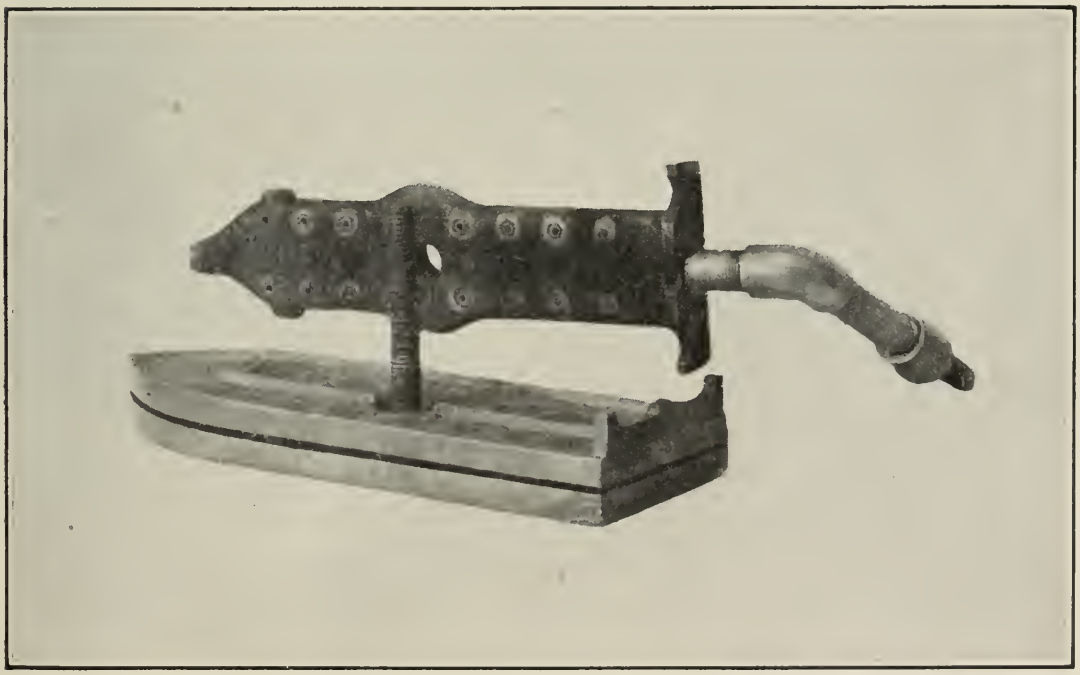

FIG. 11.—THE SAME AS FIGURE 10 WITH HANDLE PLATE REMOVED.

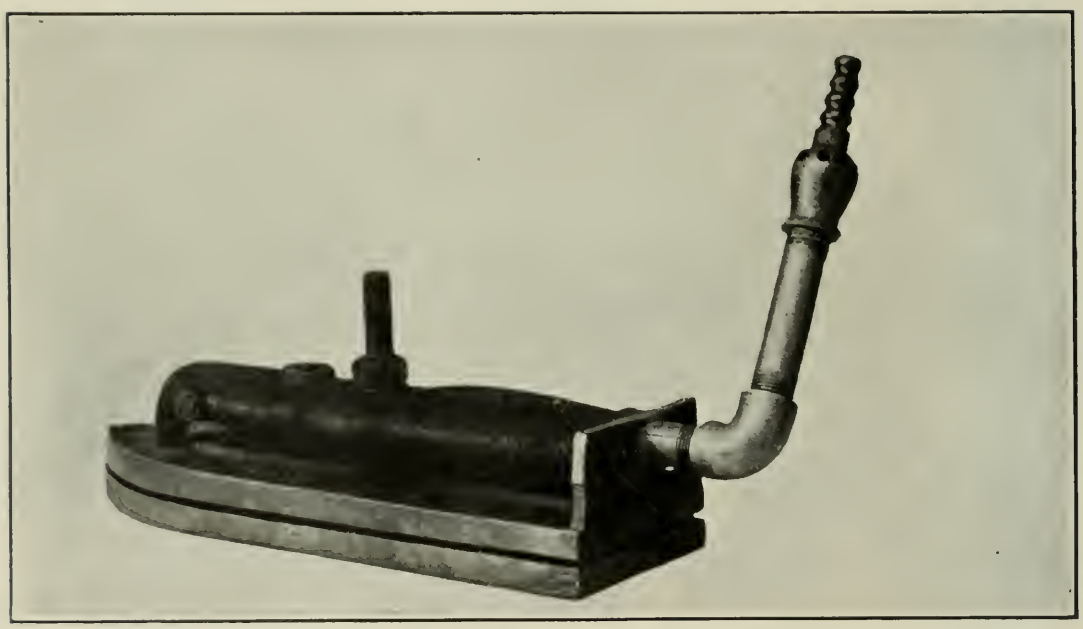

FIG. 12.—THE SAME AS FIGURE 10 WITH BOTH HANDLE PLATE AND BAR BURNER REMOVED.

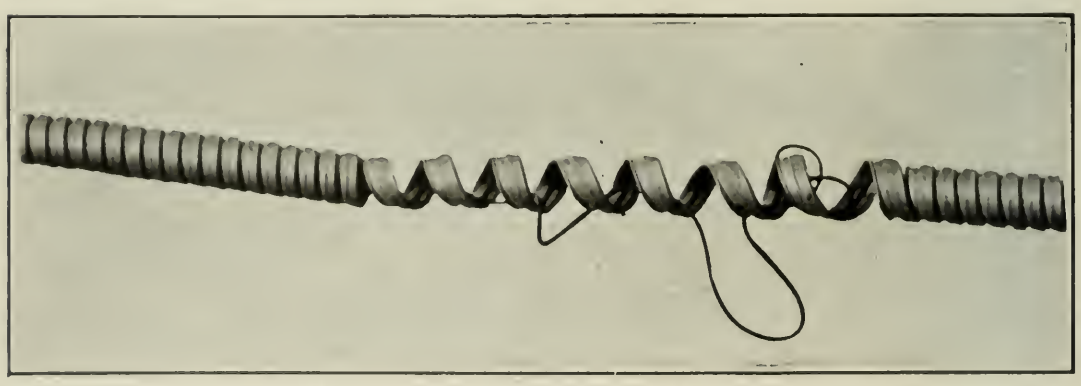

FIG. 21.—CONSTRUCTION OF FLEXIBLE METALLIC TUBING.

is covered with a screen of wire gauze. The latter serves to prevent the flame within the iron from flashing back to the point where the air and gas are mixed and also to mix the gas and air which are supplied through the tube. The cavity of the iron, or the heat chamber, is provided with a hinged door or gate which fits loosely when closed so as to permit the escape of the products of combustion.

When the burner is in place the gases emitted through the screen are protected under pressure into the combustion chamber, the products of combustion finding their way out as mentioned above.

Fig. 13

FIG. 13.—Blower iron and method of attachment to gas and air supply.

The manner of connection of the gas iron to the gas and air supply is shown in figure 13. Two separate pipe lines conduct the gas and the air, respectively. The air is supplied under pressure by means of a blower connected with a motor. A Y tube leads the mixture of gas and compressed air to the gas hose, which is fitted over the burner tube of the gas iron. By a suitable adjustment of the stopcocks leading from the gas and the air supply a proper combustion mixture is obtained. Between 5.5 and 6 cubic feet of air are used per cubic foot of gas.

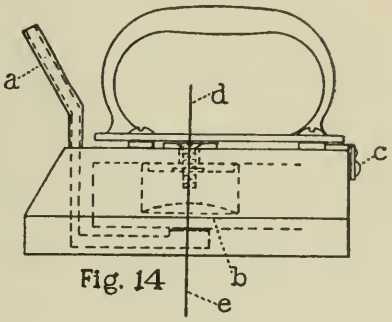

Fig. 14

FIG. 14.—Longitudinal section of blower iron.

Fig. 15

FIG. 15.—Cross section of same.

The different makes of blower irons differ principally in the arrangement of the heat-distributing devices inside the hollow of the iron. The heat chamber of some blower irons is provided with a vaultlike iron plate forming a roof like

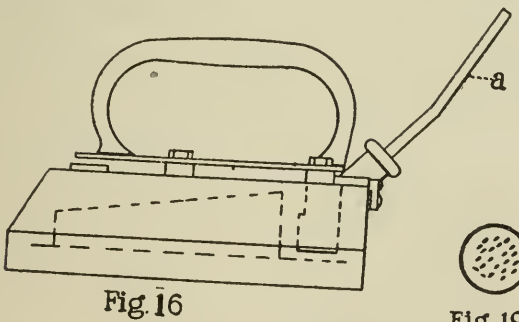

Fig. 16

Fig. 19

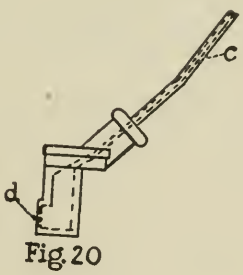

Fig. 20

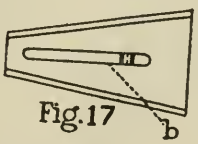

Fig. 17

Fig. 18

FIG. 16.—Section of blower iron.
FIG. 17.—Flame deflector in base of blower iron.
FIG. 18.—Sleeve for wire gauze.
FIG. 19.—Screen of wire gauze.
FIG. 20.—Tube admitting gas and air mixture into iron through opening provided with wire gauze screen (d).

an inverted U in the hollow part of the chamber; others have a more or less rectangular vault; still others are provided with disk or bell shaped pieces of iron attached to the upper wall of the hollow chamber of the iron. All these

arrangements are intended to deflect the heat to the bottom of the iron. To distribute the heat evenly over the bottom, various deflecting devices are used—some irons have corrugated surfaces; others have variously shaped elevated ridges with variously spaced flanges to divide the flame and distribute or deflect the heat advantageously. The reader is referred to figures 14 to 20 for further details of the construction of blower irons.

COMPARISON OF ATMOSPHERIC AND "BLOWER" IRONS.

In the present investigation, although one type of atmospheric pressing iron gave practically no carbon monoxide, taking all types of such irons into consideration, it may be stated that, as regards air contamination from carbon monoxide, properly regulated blower irons are preferable to ordinary gas irons. In this connection, however, it should be remembered that blower irons at times are not easy to regulate; that there may be an improper adjustment of the gas and air mixture, causing a discharge of gas into the room; and that the noise of blowers may have a tendency to produce nervous irritation. It seems well, therefore, to compare the two classes of irons in detail.

DEFECTS OF ATMOSPHERIC PRESSING IRONS.

The structural defects in atmospheric gas-heated pressing irons may be thus summarized:

If the burner is too near the base, an increase in the gas pressure causes the flames to impinge on the base of the iron, cooling the flame and resulting in improper combustion. To obviate this difficulty, some manufacturers of gas irons have drilled the perforations for gas in the burner bar at an angle or raised the bar to a suitable distance above the base of the iron, so as to give more leeway for variations in the length of the flame due to fluctuations in the gas pressure.

If the burner ports are too close together, there may be an insufficient supply of secondary air to each flame for its proper combustion. On the other hand, if the ports are too far apart, the adjacent flames will not communicate with each other soon enough when the burner is first lighted, thus permitting for a time an escape of unburned gas. There must also be a sufficient number of ports of proper dimension for the issuance of the gas flames. If the mixing tube is too short, a fluctuating flame will be produced in the first few ports, or it may skip them entirely, due to the fact that the gas has a high velocity at this point and a positive pressure has not yet been formed. On the other hand, if the mixing tube is too long, the result is a partial loss of the energy of the gas and air mixture, a reduction in the capacity of the burner, and the production of a dull flame.

Secondary air should be admitted to the interior of the iron below the burner, which should be held firmly in its proper position and yet so placed that it may be readily removed when required. Ample provision should be made for the escape of the products of combustion, preferably at the upper wall. Bends in the mixing tubes should be avoided whenever possible, as they tend to obstruct the flow of the gas and air mixture, reducing the capacity of the burner, and may produce lazy flames.

If the air mixer, the ports for the admission of air, and the orifice for the entrance of gas are not of proper design, there will be an escape of gas from the air inlet openings to the outer air. The burner and air mixer must also be so constructed as to prevent a flash back of the flame. The striking back of the flame which sometimes occurs when a gas iron is first lighted is due to the fact that an explosive mixture is present in the burner. This mixture generally occurs when a match or flame is applied to the burner before the proper mixture of gas and air has an opportunity to replace completely the air present in the mixing tube and results in the formation of acetylene, a gas having a peculiar, characteristic odor. Whenever an iron is poorly constructed, so that it takes some time after a light has been applied to a burner before the gas jets ignite, or whenever incomplete combustion takes place, the carbon monoxide present in illuminating gas is discharged into the air.

In addition to the structural defects of atmospheric gas-heated pressing irons the following defects must be considered:

(1) Partial clogging up of one or more gas ports in the gas burner in the interior of the iron by pieces of material rubbed off from the rubber tube conveying gas to the pressing iron, or by material from other sources getting into the openings of the burner, results in an additional discharge of poisonous carbon monoxide into the air of the workroom.

(2) A further source of air contamination results from the flash back which may occur by drafts striking the burner or by sudden fluctuations in the gas pressure.

(3) While an iron is being lighted the flames sometimes project outside the iron, thus making possible the ignition of inflammable cloth near the iron, in this manner starting a fire.[1]

DEFECTS OF BLOWER IRONS.

While better combustion is obtained with blower than with ordinary gas irons, there are a number of objectionable features in connection with blower irons:

[1] Recognizing the danger of fire by gas irons, the New York fire department in 1914, in a publication entitled "Fire Prevention Lessons," states, "Some gas irons are dangerous. Only irons approved by the fire department should be used."

(1) Blower irons are noisy. Continuous exposure to such noise must prove a source of nervous irritation.

(2) The intense heat of the blower iron acts on the end of the rubber tube which is in direct connection with the metal tube leading the gas and air to the iron and spreads the rubber, thus forming between the interior of the wall of the rubber tube and the metal tube of the blower iron a space through which some unconsumed gas escapes into the air of the workshop.

(3) During warm weather workers complain that the intense heat produced by the blower irons is distressing, producing discomfort and resulting in a feeling of lassitude and slowing up of work.

(4) Flying lint from the air of the shop is sometimes drawn into the blower and forced through the pipes. This is liable to stop up one of the blower irons and cause the gas to go out. It may happen as a result of this that the air blast striking the obstruction made by this lint is deflected back and this deflected air current may then extinguish all the flames of the pressing irons in the blower system. This happened in one of the largest clothing establishments in New York City.

(5) An inexperienced person will find much greater difficulty in operating a blower iron than in operating an ordinary atmospheric iron. It is often not easy to adjust the mixture of gas and air so as to be readily combustible. This results in numerous attempts to light the gas.

(6) As a consequence of this greater difficulty in properly lighting the flame of a blower iron, the accompanying flareback of the flame on first lighting the iron, or the use of a number of matches before finally getting a satisfactory flame, is more likely to start a fire in careless hands than with the use of an ordinary gas iron. Besides this, considerable quantities of illuminating gas are discharged into the workroom during such attempts.

III. PERMEABILITY TESTS OF GAS TUBING AND GAS CONNECTIONS.

TESTS OF WALLS OF GAS TUBING.

In addition to carbon monoxide derived from defective gas irons, another source of contamination of the air is the diffusion of illuminating gas through the walls of gas tubing.[1] Tests of the permeability of the walls of such tubing to illuminating gas were therefore undertaken in order to determine the extent of such leakage.

TYPES OF GAS TUBING.

Gas tubing may be divided into: (1) Tubing made essentially of rubber; (2) composition tubing; (3) flexible metal tubing; and (4) flexible steel-frame tubing.

(1) *Tubing made essentially of rubber.*—Some of this tubing has an interior spiral frame of wire surrounded by a thin rubber coating covered with glycerine and glue, with an outer braiding. The type of tubing which was found to have an extensive use in connection with gas irons has a rubber center surrounded by several layers of cloth or canvas, followed by a very thin rubber coating, and finally a thin canvas covering.

(2) *Composition tubing.*—This tubing consists of a framework of spirally wound wire covered with paper or cloth braid dipped in varnish or glycerine and glue. The coating of composition is first wrapped with thin paper and then with cloth braid as an outer finish. While this flimsy type of tubing is sold in 5 and 10 cent stores and in department stores, its use was not encountered in the garment trades.

(3) *Flexible metal tubing.*—The first United States patent for flexible metal tubing was taken out in 1860. The tube was of lead and was covered with a braiding. Tubing made of this material is not sufficiently flexible to be suitable for use in connection with gas appliances such as gas irons which are constantly moved back and forth.

The flexible metal tubing that finds extensive use consists of a long, narrow band of spirally wound steel, forming on the interior a continuous interlocking joint, which is packed, for greater tightness, with a filament of rubber or of asbestos. (Fig. 21, facing p. 20.)

(4) *Flexible steel-frame tubing.*—A skeleton framework, similar to that described above (3), is reinforced with the following coverings: Cloth braiding,

[1] According to the National Commercial Gas Association, the annual consumption of tubing in the United States for gas stoves, portable appliances, and gas irons in 1914 was about 25,000,000 feet, at prices ranging from 1¼ to 10 cents per foot.

a composition of glycerine and glue, over this cloth braiding, a paper wrapper, and, finally, an exterior cloth covering to give the tube a finished appearance. While such tubing is an improvement over flexible steel tubing alone, it is still far from being a desirable tubing for conveying artificial illuminating gas.

HISTORICAL REVIEW OF PERMEABILITY TESTS OF RUBBER TUBING.

As early as 1831 Mitchell (33) recognized the fact that gases were diffusible through sheet rubber. In measuring this permeability he used a siphon of glass having a lower end enlarged so as to form a funnel over which was fastened the rubber sheet to be examined. He inverted this siphon and poured mercury into the longer arm, thus confining in the shorter limb a portion of the air which was in communication with the rubber disk. Over the latter, in a trough of mercury, was placed the vessel containing the gas to be examined, and the velocity of penetration of the gas was measured by the time required to elevate to a given distance the mercurial column in the other limb. Mitchell found that when there was air on one side of the rubber membrane various kinds of gas passed through with different velocities. For equal volumes of different gases he found the rates of passage through a rubber membrane as follows: Ammonia, 1 minute; hydrogen sulphide, 2 minutes; carbon dioxide, 3¼ minutes; nitrous oxide, 6½ minutes; arseniuretted hydrogen, 27½ minutes; olefiant gas, 28 minutes; hydrogen, 37½ minutes; oxygen, 113 minutes; carbon monoxide, 160 minutes.

Mitchell also found that the penetration of rubber by gas could be shown by its passage into a vacuum as well as into an atmosphere of another gas. He used a long glass tube, nearly a meter in length, closed at one end by a rubber membrane. On filling the tube with mercury and inverting the open end into a mercury trough he obtained a vacuum above the mercury column into which atmospheric air gradually penetrated the rubber membrane and depressed the mercury column in the tube. He measured the rates of diffusion of different gases through the rubber by noting the time it took equal volumes of different gases to lower the mercury within the tube. Having found the time of passage of carbon dioxide to be the shortest, he took this as unity and gave the following figures for the results obtained:

TABLE V.—*Penetration of rubber by equal volumes of gas* [Mitchell].

Gas.	Time.
Carbon dioxide	1
Hydrogen	2.470
Oxygen	5.316
Olefine	6.326
Atmospheric air	11.850
Carbon monoxide	12.203
Nitrogen	13.585

In measuring the permeability of a gas through rubber, Le Roux (31) in 1866 used either a cylindrical or a conical vessel covered by a sheet of the material under examination. The vessel was filled with a gas and the diffusion estimated from the decrease in volume at the end of an hour.

In the same year Aronstein and Sirks (2) made permeability measurements by using an apparatus which consisted essentially of a piece of rubber tubing plugged up at the end, connected at the open end to a vessel filled with hydrogen. The manometer of the vessel was so adjusted that the pressure

of a constant volume of gas was read. The amount of diffusion, as measured by the diminution of volume, was calculated from the following formula:

$$d=1-\frac{H'(1+\alpha t)}{H(1+\alpha t')},$$

where d represents the diminution in volume, H and t represent the pressure and the temperature at the beginning, H′ and t' the pressure and temperature at the end, and α is the coefficient of cubic expansion.

Reychler (46) described an experiment of Pictet, who took a glass tube open at both ends, closed one end by a thin sheet of rubber, then filled the tube with mercury and inverted it in a trough of the same metal. On introducing a gas into this mercury tube, or barometer, as the gas diffused through the rubber partition to the outer air, the column of mercury rose inside the tube, the amount of diffusion being measured by the amount of rise of the mercury column.

In 1907 Ditmar (9) measured the diffusion of illuminating gas through rubber tubing by the diminution in the volume of gas originally present and the subequent rise in a column of sulphuric acid. He passed the gas first through a flask of concentrated sulphuric acid and a calcium chloride tube to remove moisture from the gas, then through a piece of rubber tubing which was connected to a graduated glass tube leading almost to the bottom of a bottle containing concentrated sulphuric acid. Through another opening in the stopper of this bottle there passed a calcium chloride tube to keep away moisture from the sulphuric acid. The difference in the height of the column of sulphuric acid in the graduated tube between the position before passing in illuminating gas and after passing illuminating gas for a given time was a measure of the diffusion through the rubber tube.

Fayol (14), in 1909, described a rather crude method of estimating the permeability of rubber for gas. This consisted in placing on a balance a rubber flask which communicated with a manometer. From the diminuition in weight of the rubber flask and from the decrease in barometric pressure the amount of diffusion of gas through the rubber was estimated.

In 1912, Steinitzer (60) measured the diffusion of gases through a rubber membrane by passing the gas through the opening of a bottle connected with a manometer into a vessel resembling two hemispheres separated by a sheet of the rubber to be tested. From the upper hemisphere a delivery tube passed into the bottom of a tube filled with mercury, dipping into a trough of the same metal. Gas diffusing through the rubber membrane displaced the mercury in the tube and the volume of gas in the tube containing mercury was a measure of the amount of gas that diffused through the tubing. The diffusion was expressed as the number of cubic centimeters of gas per square centimeter of rubber surface.

METHOD USED IN THIS INVESTIGATION.

Examination of the foregoing methods showed that none was suitable for the measurement of the permeability of illuminating gas through the walls of gas tubing in terms of the poisonous constituent carbon monoxide gas. After some experimentation the following method was therefore selected:

The tube to be tested for permeability was inclosed in a long glass tube (fig. 10), through one end of which it was connected to the gas supply by means of a meter provided with a pressure

gauge and mercury governor regulating the pressure; the other end of the gas tube was connected by means of a short piece of tubing to a small Bunsen burner so as to provide a constant passage of gas through the tube undergoing a test. The glass tube inclosing the gas tubing had one end open to the air, the other end was connected with a purifying train of absorption vessels designed to hold back all gas-leakage products that could interfere with the determination of carbon monoxide. Aspiration at one end of the apparatus would draw through it any leakage products that had diffused into the outer glass tube together with air of the room. The diffused carbon monoxide was passed over heated iodine pentoxide in the manner previously described, the iodine liberated being absorbed in a potassium iodide solution and the amount of iodine found by titration with N/1,000 sodium thiosulphate. The value thus found, less the value for a blank analysis of the air of the room, was the measure of the carbon monoxide which had been diffused through the walls of the tube.

By referring to figure 22 the apparatus used in the tests may be examined in greater detail. The gas tube T undergoing a permeability test was inclosed in the long glass tube R (about 100 cm. long and 4.4 cm. wide). This was closed at each end by means of a stopper provided with two holes, one of which served for the passage of the gas tube. Through the stopper at the admission end, Z′, of the tube there passed a short piece of glass tubing provided with a stopcock on the outside of the stopper for the entrance of the air of the room. Through the stopper at the other, or exit, end, near Z^2, there passed another glass tube with a stopcock also on the outside of the tube, R. The tube at Z^2 was directly connected with the train of purifying absorption bulbs and these with the iodine pentoxide tube, iodine absorption bulb, and aspirator. The gas tube T was directly connected with the gas supply measured through the meter M, which was supplied with a pressure gauge and a mercury governor regulating the pressure. The exit end of the gas tube was directly connected by means of a short piece of tubing to a small Bunsen burner, b, so that a constant flow of gas was taking place all the time through the gas tube to be tested. The products of leakage in the gas tube T would therefore pass through its walls to the outer inclosed space of the glass tube. Upon starting aspiration the leakage products, if any, together with the air of the room (entering at Z′) would be swept through the apparatus and the diffused illuminating gas measured in terms of carbon monoxide.

The purifying train consisted of the absorption bulbs K, containing concentrated sulphuric acid to dry the air and to remove some of the unsaturated hydrocarbons, and bulbs H containing

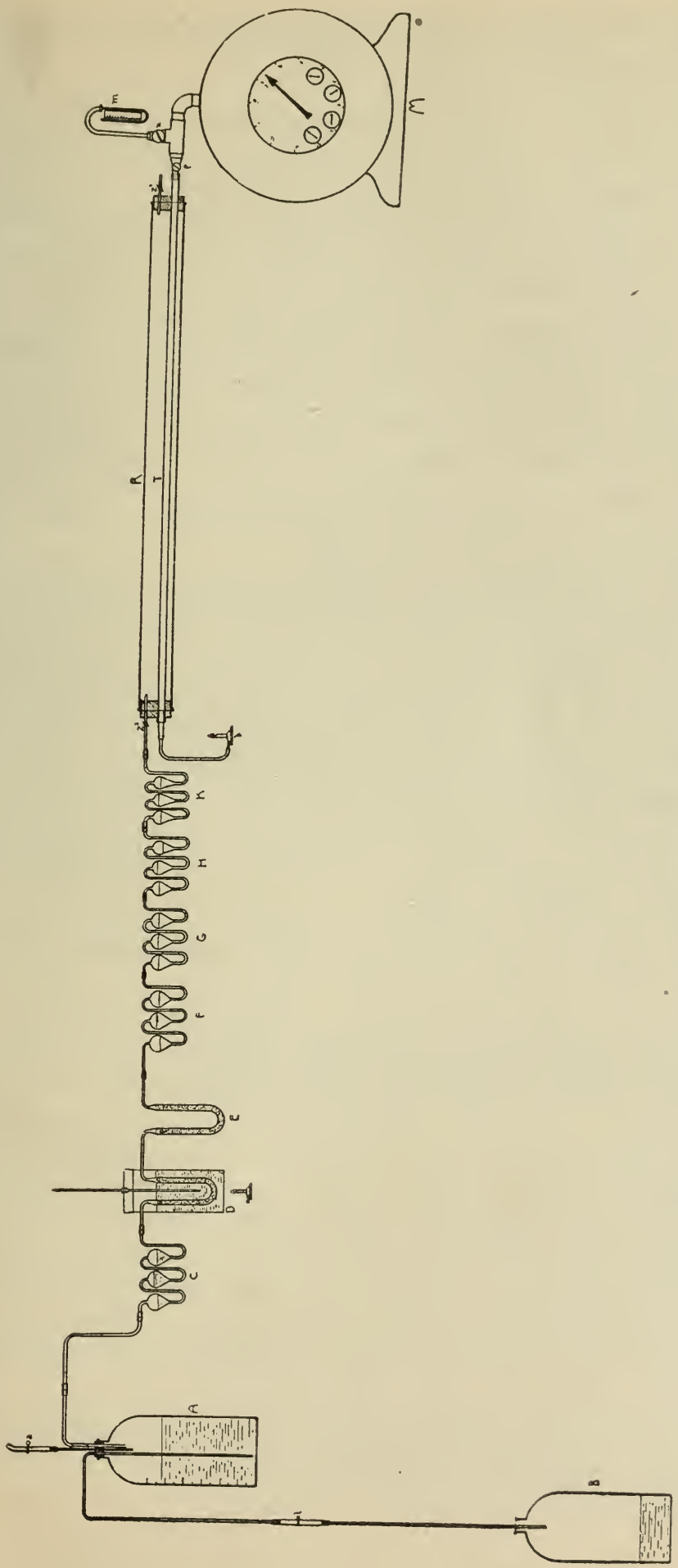

FIG. 22.—Apparatus for determining the permeability of the walls of tubing to gas.

fuming sulphuric acid to retain unsaturated hydrocarbons. The rest of the apparatus was as described in connection with the analysis of air samples from workshops (p. 8).

To render the cork stoppers gas tight their surfaces were coated with water glass, and this was then allowed to dry; the small spaces between the stopper and the tubing going through it were packed with cotton wadding saturated with water glass. On drying, the water glass formed an impervious coating. The round surface of the stoppers was covered with tin-foil and fitted tightly into a glass tube, the points of contact between the stoppers and the glass tube being also coated with water glass. The joints of the various absorption bulbs were connected by short pieces of tight rubber tubing, the glass ends of the separate bulbs were made to touch end to end, and the points of contact of glass tubes and rubber connections were coated with water glass. No collodion or similar material was used to seal joints, as it was desired to exclude organic matter, which reacts with the reagent iodine pentoxide.

To begin a determination, the iodine pentoxide was first heated to 150° C., all the connections made tight, the reading on the gas meter noted, the gas pressure regulated to 2 inches of water column[1] by adding weights on the mercury seal of the governor, the gas lighted at the Bunsen burner *b*, and the flame adjusted so as to burn a fixed quantity of gas, say, one-fourth of a cubic foot per hour. Aspiration was started by blowing into the tube *a*, which permitted the water from the reservoir A to start flowing into the bottle B, and the stop cocks Z' and Z^2 were opened, so as to permit the diffused gas to pass through the apparatus. The rate of aspiration, regulated by the pinch cock at 1, was so adjusted as to aspirate air through the apparatus at the rate of about 1 liter per hour. Aspiration was continued for four hours, when the potassium iodide absorption bulb was removed, the contents transferred to a small beaker and titrated with N/1000 sodium thiosulphate until the disappearance of the iodo-starch blue. Each c. c. of N/1000 sodium thiosulphate was equivalent to 0.056 c. c. of carbon monoxide at 0° and 760 mm. pressure. At the conclusion of the four-hour test the gas supply was shut off and the reading of the gas meter taken. Air from the room was now swept through the apparatus until no free iodine was carried over from the iodine pentoxide tube, and a correction made for the amount of carbon monoxide here found. For gas tubes with a small permeability, aspiration for a half hour to an hour sufficed; for tubes with greater permeability a longer aspiration was required. To

[1] As the pressure of gas furnished in New York City may be as high as 6 inches of water, and as the average pressure is about 3 inches, it is evident that with the greater gas pressure the results for the permeability of the walls of tubing to illuminating gas would be greater than under the conditions of the experiment.

compensate for the carbon monoxide contained in the room, blank analyses of the air of the room were made under the same conditions as in the regular test and with aspiration of like amounts of air. The amount of carbon monoxide in the air of the laboratory was deducted from the total. The number of cubic centimeters of carbon monoxide thus found, divided by the number of hours the gas diffused through the tube undergoing a permeability test, and by the length of this tube in feet, gives the number of cubic centimeters of carbon monoxide per foot per hour diffused through the walls of the gas tube under the gas pressure used. As the pressure varies at different times of day, for the purpose of getting comparative results, a uniform gas pressure of 2 inches of water was used throughout all the tests. The governor for regulating gas pressure was of the standard type used by gas companies.

RESULTS OF TESTS ON TUBING.

Sixty-eight permeability tests were made on the walls of 30 pieces of gas tubing. The tests included 16 different varieties of tubing.

These results show (1) that none of the gas tubes tested was found to be gas tight; (2) that the walls of tubing through which illuminating gas had been passed before making a test were more permeable to the gas than in the case of brand new tubing; (3) that rubber tubing is the least permeable to illuminating gas; (4) that flexible metal tubing and "composition" tubing give considerable leakages of illuminating gas.

The following tables set forth in tabular form the results of these tests:

TABLE 6.—*Permeability tests on new rubber tubing.*

Description of tubing.	Average thickness of wall (inches).	Length of tubing (feet).	Duration of test (hours).	Gas pressure (inches of water).	Cubic feet of gas per hour.	Carbon monoxide.	
						Total (c. c.).	Per foot of tubing per hour (c.c.).
Red outside, black inside, cloth insertion, $\frac{3}{8}$-inch, used for ordinary gas irons	0.1137	3	4	2	0.29	0.0420	0.0035
					.27	.0392	.0032
					1.0	.0392	.0032
					2.0	.1232	.0102
					3.0	.0528	.0044
					4.0	.0140	.0011
Red outside, black inside, cloth insertion, $\frac{5}{16}$-inch, used for blower irons	.1045	3	4	2	.25	.0392	.0032
					1.0	.0616	.0051
					2.0	.0168	.0014
					3.0	.0112	.0009
					4.0	.0448	.0037
Red outside, white inside, cloth insertion, $\frac{3}{8}$-inch, used for ordinary gas irons	.1361	3	4	2	.25	.2408	.0200
					1.0	.0336	.0028
					2.0	.0784	.0065
					4.0	.0252	.0021
Red outside, white inside, cloth insertion, $\frac{5}{16}$-inch, used for blower irons	.1109	3	4	2	.25	.6776	.0564
					1.0	.1904	.0158
					2.0	.1288	.0101
					3.0	.3024	.0252
					4.0	.0896	.0074

TABLE 7.—*Permeability tests on rubber tubing after passing gas through same for 60 hours and for 30 days (240 hours).*

Description of tubing.	Average thickness of wall, in inches.	Gas pressure, in inches of water column.	Cubic feet of gas per hour.	Cubic centimeters of carbon monoxide per foot of tubing per hour.		
				New tubing.	Tubing after passing gas for 60 hours.	Tubing after passing gas for 30 days, or 240 hours.
Red outside, black inside, cloth insertion, $\frac{5}{16}$ inch, used with blower gas irons	0.1044	2	0.29	0.0035	0.0114	0.0810
			1.0	.....	.....	.1689
			4.0	.....	.0392	.1148
Red outside, black inside, cloth insertion, $\frac{3}{8}$-inch, used with ordinary gas irons	.1136	2	.25	.0035	.....	.0943

TABLE 8.—*Permeability tests on rubber tubing that had been used in shops of the garment industry.*

Shop No.	Kind of tubing.	Kind of gas iron with which used.	Length of time said to have been in use.	Condition of tubing.	Gas pressure, in inches of water.	Cubic feet of gas per hour.	Cubic centimeter of carbon monoxide per foot of tubing per hour.
1	Rubber, $\frac{3}{8}$-inch, cloth insertion.	Ordinary	4 months	Part of outer layer peeled off.	2	4	0.2047
2	Rubber, $\frac{5}{16}$-inch, cloth insertion.	"Blower"	6 months	Old looking	2	4	.1568
3	do	do	8 months	Cracks in outer layer of tube.	2	4	.2406
4	Rubber, $\frac{3}{8}$-inch, cloth insertion.	Ordinary	1 year	Part of tube seared	2	4	.3564
5	Rubber, $\frac{5}{16}$-inch, cloth insertion.	"Blower"	do	Part of outer layer peeled off.	2	4	.2969

TABLE 9.—*Permeability tests on miscellaneous rubber tubing.*

Description of tubing.	Condition of tubing.	Length of tube, in feet.	Number of hours of test.	Gas pressure, in inches, of water.	Cubic feet of gas per hour.	Carbon monoxide.	
						Total (c. c.).	Per foot of tubing per hour (c. c.).
Double coat of rubber, outer coat gray, inner coat red.	New	3	4	2	0.275	0.0224	0.0018
(1) Core of rubber in 2 layers with 4-ply cloth insertion between; (2) composition; (3) exterior braiding.	do	3	4	2	.25	.0896	.0074
Inner black, outer red coat covered with wire spring.	do	3	4	2	.25	.0168	.0014
Rubber, with interior wire spring.	do	3	4	2	.275	.0672	.0056
(1) Wire coil; (2) rubber; (3) composition; (4) outer cloth covering.	New tubing through which gas was passed for 60 hours before test.	3	4	2	1.0	.0784	.0065
(1) Wire coil; (2) black rubber; (3) layer of thin paper; (4) green cotton braiding; (5) olive-green outer cloth covering.	New tubing through which gas was passed for 30 days (240 hours) before test.	3	4	2	.25	.0112	.0009

TABLE 10.—*Permeability test on new flexible metal tubing.*

Material.	Description.	Length of tubing, in feet.	Duration of test, in hours.	Gas pressure, in inches, of water.	Cubic feet of gas per hour.	Carbon monoxide.	
						Total (c. c.).	Per foot of tubing per hour (c. c.).
Metal	Flexible, No. 1	3	4	2	0.275	0.6832	0.0569
					.26	.9072	.0756
					1.0	.1288	.0107
					2.0	.2296	.0191
					3.0	.4876	.0406
					4.0	.3472	.0289
					6.0	.7224	.0602
Do	Flexible, No. 2	3	4	2	.27	.4088	.0340
					1.0	.6776	.0564
					2.0	1.3112	.1092
					3.0	.9184	.0765
					4.0	.6608	.0550
					6.0	.7906	.0658
Do	Flexible, No. 3	3	4	2	.275	2.6264	.2188
Do	Flexible, No. 4	3	4	2	4.0	.3360	.0280
					6.0	.2352	.0195

TABLE 11.—*Permeability tests on flexible metal tubing after passing gas through same for 60 hours and for 30 days (240 hours).*

Description.	Gas pressure, in inches, of water.	Cubic feet of gas per hour.	Cubic centimeters of carbon monoxide per foot of tubing per hour.			Remarks.
			New tubing.	Tubing after passing gas through for 60 hours.	Tubing after passing gas through for 30 days, or 240 hours.	
Flexible No. 1, metal	2	¼	0.0340	0.1045	0.2281	2 hours' test instead of usual 4 hours.
		1	.....	.....	.4610	
		4	.....	.....	.2584	
Flexible No. 2, metal	2	¼	.....	.....	.2743	
		4	.0289	.....	.0812	
Flexible No. 3, metal	2	0.275	.....	.2188	.7435	Do.

TABLE 12.—*Permeability tests on flexible metal tubing that had been used in shops of the garment industry.*

Shop No.	Kind of gas iron with which used.	Length of time said to be in use.	Condition and appearance of tubing.	Gas pressure, in inches of water.	Cubic feet of gas per hour.	Cubic centimeter of carbon monoxide per foot of tubing per hour.
1	Ordinary	3 months	Apparently good condition; old appearance.	2	4	0.4205
2	do	6 months	Apparently good; appearance dark	2	4	.5837
3	do	1 year	Apparently good; appearance old	2	4	.8614

TABLE 13.—*Permeability tests on composition tubing.*

Description of tubing.	Condition of tubing.	Length of tube tested, in feet.	Number of hours of test.	Gas pressure, in inches of water.	Cubic feet of gas per hour.	Carbon monoxide.	
						Total (c. c.).	Per foot of tubing per hour (c. c.).
(1) Core of galvanized-iron spring; (2) layer of thin paper; (3) cotton braiding; (4) composition, glycerin and glue; (5) outer braiding.	New	2	4	2	1	0.0168	0.0014
As above	Gas passed through tube for 60 hours before test.	2	4	2	1	1.9096	.1591
(1) Core of wire spring; (2) layer of thin paper; (3) cotton braiding; (4) composition, glycerin and glue; (5) layer of thin paper and loose strands of thread; (6) layer of asbestos; (7) wire coil.	New	2	4	2	.275	2.0160	.1680
As above	Gas passed through tube for 60 hours before test.	2	4	2	.275	3.0408	.2534

DISCUSSION OF RESULTS.

Rubber tubing.—Thirty-seven permeability tests were made on the walls of 17 samples of rubber tubing. These tests included 10 different varieties of tubing. In the case of new rubber tubing, such as is used for gas-heated pressing irons in the garment industry, the smallest leakage was 0.0009 c. c. and the greatest 0.0564 c. c. of carbon monoxide per foot of tubing per hour. The average for 20 specimens of tubing examined was 0.0093 c. c. of carbon monoxide per foot of tubing per hour.

The average permeability of 10 new rubber tubes of the kind used for ordinary gas irons was 0.0057 c. c. of carbon monoxide per foot of tubing per hour. The average thickness of the walls of the tubes was 3.172 mm. The average permeability of 10 new rubber tubes of the kind used for blower irons was 0.0129 c. c. of carbon monoxide per foot of tubing per hour, and the average thickness of the walls of these tubes was 2.735 mm. Other things being equal, a decrease in permeability of a tube accompanies an increase in the thickness of the walls.

In two cases where new rubber tubing was tested, both when new and after gas had been passed through the tubes for 60 hours, there was a greater leakage in the case of the tubing after gas had been passed through them, in one case the leakage being about 4 times greater and in the other about 10 times greater than in the tubing used for the first time. In four cases where rubber tubing was

tested, both when brand-new and after passing gas through each for 30 days, or a total of 240 hours, there was a great increase in the leakage through the tubes after the prolonged passage of gas. After this treatment the permeability of the rubber tubing ranged from 0.0810 c. c. to 0.1689 c. c. of carbon monoxide per foot of tubing per hour, and the increase in permeability ranged from 23 to 33 times the original permeability.

Old rubber tubing.—Samples of gas tubing that had been in use for different lengths of time were procured from shops in the garment industry by giving in exchange for the old tubing new pieces of equivalent length. One tube that had been in use for six months was old looking, but had no cracks or breaks in the surface. It gave a permeability figure of 0.1568 c. c. of carbon monoxide per foot of tubing per hour. New tubing of apparently the same quality gave a result of 0.0037 c. c. of carbon monoxide per foot of tubing per hour. The worst case was that of a tube that had been in use for a year and was partly seared. This gave a permeability of 0.3564 c. c. of carbon monoxide per foot of tubing per hour, while new tubing of the same quality gave a permeability result of 0.0011 c. c. of carbon monoxide per foot of tubing per hour, or 324 times less.

Miscellaneous rubber tubing.—Permeability tests on four different makes of new rubber tubing gave results ranging from 0.0014 to 0.0074 c. c. of carbon monoxide per foot of tubing per hour. In one case a test was made on a cloth-covered new rubber tube through which gas had been passed for 30 days, or 240 hours, and a permeability result of 0.0009 c. c. of carbon monoxide was obtained per foot of tubing per hour. This is an example of tubing with low permeability.

Flexible metal tubing.—Twenty-seven permeability tests were made on the walls of 11 specimens of flexible metal tubing. The tests included four varieties of tubing. In the case of new flexible metal tubing the smallest leakage of gas was 0.0107 c. c. and the greatest was 0.2188 c. c. of carbon monoxide per foot of tubing per hour, while the average for 16 specimens was 0.0597 c. c. of carbon monoxide per foot per hour. After gas had been passed through these for 30 days, or a total of 240 hours, the lowest result obtained was 0.0812 c. c., while the highest leakage was 0.7435 c. c. of carbon monoxide per foot of tubing per hour. In the case of samples of flexible tubing, in use for various periods of time in the shops of the garment industry, which were obtained by giving in exchange new flexible metal tubing, the results in three tests ran from a minimum of 0.4205 c. c. to a maximum of 0.8614 c. c. of carbon monoxide per foot of tubing per hour. The leakage here was relatively great. Although the tubing had been used for periods of time ranging from three months to a

year, none of the tubing was visibly defective. There were no bends or cracks in these samples, but the metal was dark instead of light in color, as when new.

Composition tubing.—Four permeability tests were made of the walls of two kinds of composition tubing. These tests in one instance gave 0.0014 c. c. and in the other (an asbestos-covered composition tube) 0.1680 c. c. of carbon monoxide per foot of tubing per hour. When gas was passed through these tubes for 60 hours and then tested for permeability, the one which gave 0.0014 c. c. now gave a permeability of 0.1591 c. c. of carbon monoxide per foot of tubing per hour, or about 113 times the original leakage, while the asbestos-covered composition tube gave a permeability of 0.2534 c. c. of carbon monoxide per foot of tubing per hour, or an increase of over 50 per cent in the gas leakage.

DEFECTS OF GAS TUBING.

Rubber tubing.—Owing to the demand for cheap gas tubing a great deal of inferior or worthless rubber hose is on the market. Much of this material is stiff and almost devoid of elasticity. It is reported (30), in connection with a complaint regarding laboratory tubing which, though represented as of the first quality when sold, became hard and inelastic within a short time, that a rough analysis showed 68 per cent of mineral matter. It is no wonder, then, when tubing is made up for the greater part of mineral filler, and when the rubber used is often old scrap rubber, that there should be so much difficulty in procuring a tubing fairly impermeable to gas.

Regarding the diffusion of illuminating gas through rubber tubing, it is stated (30) that there is less diffusion in the case of moderately compounded rubber than in the case of pure rubber and sulphur tubing. India rubber is penetrated by gas, so that the naphtha which is deposited in the walls by condensation from the gas softens the rubber and, in time, destroys its utility. Attempts to protect the interior of such tubes by means of oil varnish have failed, as the varnish cracks, and the gas and its deposits, penetrating the body of the tube, render it leaky. Various modifications in the composition of the rubber have been suggested for rendering the latter less permeable to gas, such as the addition to the rubber of gum shellac, the replacement of the lead by some metallic oxide, as oxide of zinc, and the reduction of the sulphur to the smallest possible amount.

Flexible metal tubing.—While flexible metal tubing may be suitable for conducting water, oil, steam, compressed air, or any gas which is not poisonous, or the escape of which will not contaminate the surrounding air, the ordinary form can not be regarded as suit-

able for conducting a highly poisonous gas like illuminating gas, because, after all, the tube is nothing but a series of joints, any one of which if not tight will become a continuous source of leakage for illuminating gas.

A mere visual examination of a defective flexible metal tube will often fail to reveal the fact that it is a dangerous tube to use, from the hygienic point of view. The exterior of the tube may look well, and breaks or dents may not be visible; yet the tube may be a prolific source of air poisoning.

There are several ways in which it is possible for flexible metal tubing to be rendered worthless. The thin thread of elastic which is used as a packing for the interlocking joints wears out with age, proximity to heat, the action of the gas, and the strain of use.

The constant proximity of a part of the flexible metal tube to a heating appliance, such as a pressing iron or radiator, will affect the thin rubber thread on the inside of the interlocking joints of the flexible metal tube, resulting in the weakening and destruction of the packing. Even if not near a hot appliance, the thin rubber thread is acted on by the gas, being in time weakened and decomposed. In addition to this destruction of the rubber through natural causes, there is the human factor to be considered. Carelessness in the handling of the flexible metal tube, such as a slight twist, is likely to dislocate the rubber thread from its usual position in the groove of the interlocking joints, or the accidental compression of the tube by some weighty object may loosen one or more of the numerous joints. In the case of rubber tubing, such carelessness in handling would not do the damage which is done to flexible metal tubing.

Another objection to the use of flexible metal tubing is that this tubing needs special handling on the part of the dealer. The tubing is sold in prepared lengths of 3, 4, 5, or 6 feet or it is cut from a large roll for the consumer, according to the length required. As to the cutting of the flexible metal tubing, if not done with a sharp hacksaw, there is danger of loosening the rubber thread of the tube. If the dealer stores the metal tube in damp or in overheated places or in places which are too cold or are exposed to sunlight, if other material is piled on the tubing, or if the tubing is hung on hooks, deterioration will set in. It has been stated by a manufacturer (27) of flexible metal tubing, who admitted that metal tubing when not in use is liable to be overbent, that if this kind of tubing were kept by the dealer in strong, suitable boxes and kept covered with well-fitting covers until it reaches the hands of the user, the latter would receive a satisfactory metal gas tubing. This statement assumes that the tubing is originally good. In this connection the writer has

found that flexible metal tubing received direct from manufacturers and carefully stored, when tested for permeability, showed leakage when new, and when tested after allowing gas to pass through the same for 30 days, showed considerable leakage.

The use of asbestos packing for sealing the interlocking joints of flexible metal tubing is far worse than the use of the rubber thread, because if the metal tube is slightly twisted or stretched there is a tendency of the rubber thread to resume its original place, whereas with asbestos this tendency does not exist and a bad leak starts at once.

Composition tubing.—The defects of this tubing are described on page 25.

PERMEABILITY TESTS OF GAS CONNECTIONS.

RUBBER ENDS FOR FLEXIBLE GAS TUBING.

Defective and poorly fitting rubber connections, as a rule, are a greater source of leakage than defective gas tubing. The rubber ends attached to the tubing (one of which is intended to fit over the gas supply and the other over the gas appliance) are often made of reclaimed old rubber scrap. They are consequently rigid, possessing but little elasticity, and often fit badly, even when first used. It is but natural, then, that such rubber ends soon harden, lose the little elasticity originally present, and become so loosely fitting that great gas leakage ensues. Rubber ends made even of good material will in time also spread and harden with use, because of their proximity to the source of heat, thus becoming worthless or even dangerous.

The rubber ends attached to gas tubing not entirely made of rubber are often poorly attached to the tubing, frequently merely with glue. In the case of the ordinary flexible metal tubing, a glue connection is the usual procedure. It is no wonder that such slipshod connections soon become loose or completely detached. In such instances the attempts made by the user to refasten the rubber end to the tube often result in a tube voluminously bandaged, which looks as if it were suffering from some dread disease. Such defective tube ends are a continuous source of gas poisoning to those working in their vicinity. These same unhappy attempts to bandage tubing are often seen in the case of the ends of rubber tubes which have become spread from proximity to heat from a gas appliance, such as a pressing iron.

In some cases hollow wooden plugs are used for the interior of rubber ends. Such wooden plugs should never be used, as they soon become charred or split and then easily fall out.

Attempts have been made to devise means for fastening the rubber end to the tube by the use of metallic bands placed over the cloth

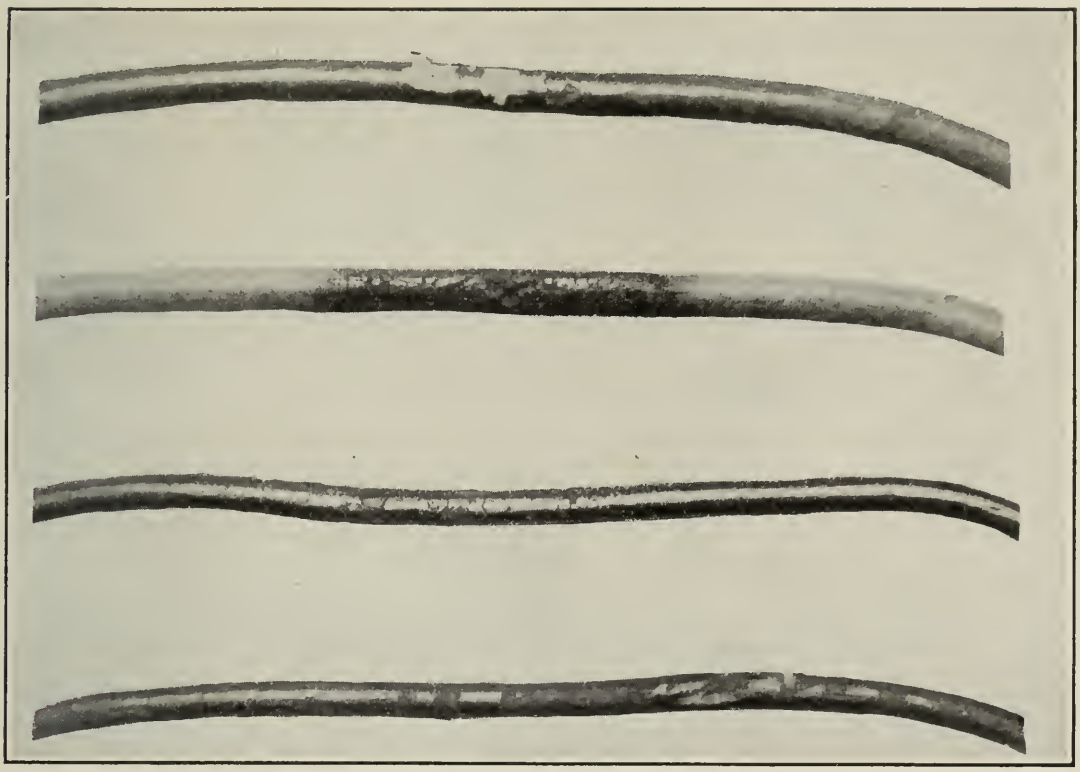

FIG. 23.—DEFECTIVE RUBBER TUBING FOUND IN USE IN SHOPS OF GARMENT INDUSTRY.

FIG. 24.—DEFECTIVE RUBBER ENDS OF RUBBER TUBING AND OF FLEXIBLE METAL TUBING. NOTE BANDAGED RUBBER ENDS OF FLEXIBLE TUBING.

FIG. 25.—DEFECTIVE RUBBER TUBING. NOTE THE CONDITION OF THE RUBBER ENDS, MAKING POSSIBLE CLOGGING OF BURNER OPENINGS OF GAS IRON BY PIECES OF RUBBER FROM TUBING.

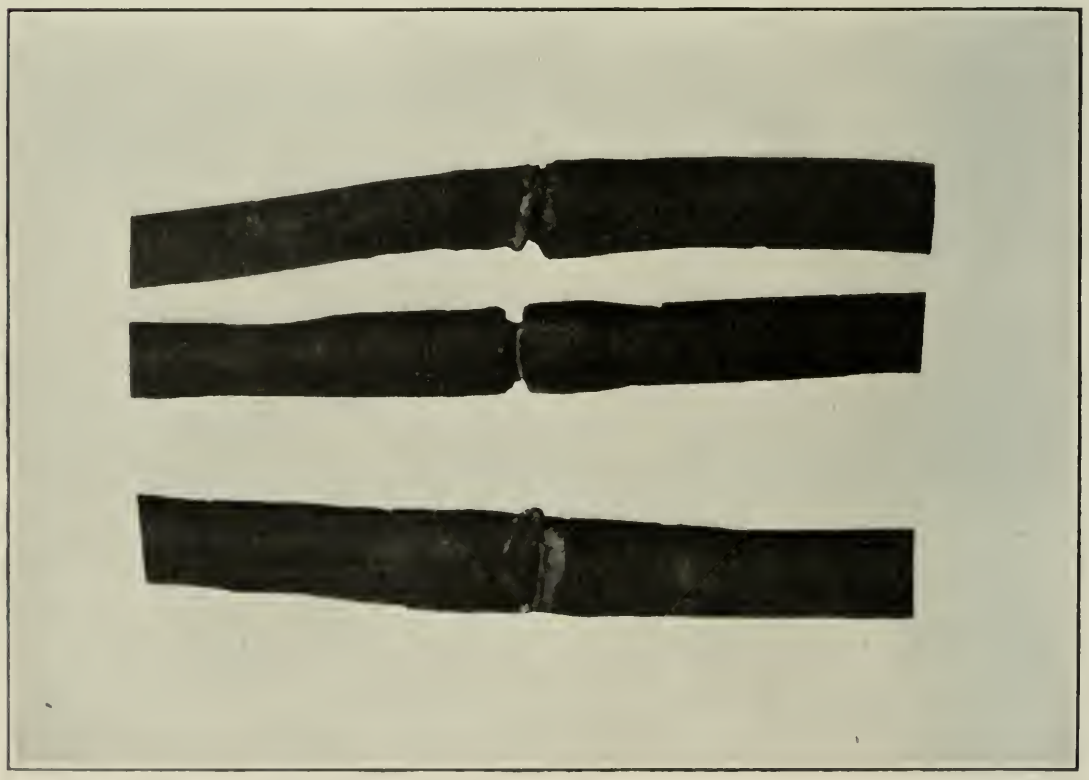

FIG. 26.—JOINTED GAS TUBING FOUND IN USE IN SHOPS OF THE GARMENT INDUSTRY.

braiding of the tube, and, with the aid of glue, to make the connection between tube and rubber end secure. While this procedure may fasten one end of the rubber connection to the tube securely, yet the rubber connection which is pushed or slipped over the gas cock spreads after a time, just as in the case of rubber tubing, so that the gas is likely to escape at this point of connection. Rubber ends, therefore, are not adapted for making permanent connections between gas tubing and the stopcocks of gas appliances in constant use, such as lamps, gas stoves, or pressing irons.

METHOD USED IN PERMEABILITY TESTS.

To get an idea of the extent of leakage through the gas connection between a gas tube and the metal tube leading into a pressing iron when the gas tubing fits tightly over the metal tube of the iron, permeability tests were made on such connections. The arrangement of the apparatus was the same as in the case of permeability tests on tubing as described on page 27, except that in place of a long glass tube inclosing 3 feet of the tube to be tested a short 6-inch glass tube was used which inclosed a piece of rubber gas tubing of about 3 inches in length, fitting over a short length of metal tube of the same kind as that leading the gas from the flexible gas tube into the gas iron. The longitudinal surface of the rubber tube was coated with a layer of water glass and allowed to dry, so as to exclude any permeability from the tube itself. In fitting on the rubber tube over the metal care was exercised to see that the connection was tight.

RESULTS OF TESTS.

The results of these tests are shown in the following table.

TABLE 14.—*Tests on permeability of gas connections.*

Connection between rubber and metal tubes.	Number of hours of test.	Cubic feet of gas per hour.	Gas pressure, in inches of water.	Carbon monoxide.	
				Total (c. c.).	Per hour (c. c.).
Tight	4	1	2	2.4696	0.6174
Do	4	4	2	2.0832	.5208
Do	4	4	2	2.3688	.5922
Do	4	6	2	1.0080	.2520
Do	4	6	2	.5096	.1274
Do	4	6	2	.7384	.1846
Do	4	6	2	1.7584	.4396
Very tight	4	6	2	.0168	.0014
Do	4	6	2	.2800	.0700

The results ranged from a leakage of 0.0014 c. c. to one of 0.6174 c. c. of carbon monoxide per hour, the average being 0.3117 c. c. of carbon monoxide per hour. If it be remembered that these figures

are for tight connections, it can be imagined what the results might be for the ends of old tubing (see figs. 24 and 25) that had become spread with heat and with use.

TESTS OF PERMEABILITY OF PIECED CONNECTIONS.

In addition to tests of the permeability of gas connections, tests were made of the permeability of pieced connections (fig. 26), such as are often used in shops of the garment trades to eke out scanty lengths of tubing or to repair leaks. The results of these tests are set forth in the following table (Table 15):

TABLE 15.—*Permeability test on joints of pieced gas tubing used in shops of garment industry.*

	Number of hours of test.	Gas pressure in inches of water.	Cubic feet of gas per hour.	Carbon monoxide.	
				Total. (c. c.).	Per hour (c. c.).
Sample No. 1	2	2	6	1.5808	0.7909
Sample No. 2	2	2	6	.9536	.4768
Sample No. 3	2	2	6	1.6720	.8360

TESTS OF PIECES OF RUBBER TUBING CONNECTED BY METAL TUBE.

Specimens of jointed gas tubing made up of two pieces of rubber tubing connected by a short piece of metal tube were obtained from shops in the garment industry in which they were being used, by giving in exchange for them new pieces of tubing. The joints of these tubes were tested for permeability in the same way as the gas connection described above on page 39. The diffusion of carbon monoxide per hour ranged from 0.4768 to 0.8360 c. c. Even if the diffusion were much less, the continued motion, back and forth, of the gas iron is liable to strain and pull apart the jointed parts of the tube.

IV. HYGIENIC SIGNIFICANCE OF SMALL AMOUNTS OF CARBON MONOXIDE.

CARBON MONOXIDE POISONING.

PROPERTIES AND OCCURRENCE OF THE GAS.

Carbon monoxide is a colorless, odorless, and tasteless gas, practically insoluble in water, having a specific gravity (0.9673) slightly less than that of air. It burns with a blue flame and forms explosive mixtures with air or oxygen.

In addition to being present in illuminating gas, carbon monoxide is formed whenever any carbon containing material is burned in an incomplete supply of air. It is also formed in a large number of industrial processes, such as in steel making, in foundries, about limekilns and gas engines, in gas manufacture, and in mining. Carbon monoxide may find its way into the confined air of inhabited places through direct leakage from defective gas mains, pipes, and joints, through defective gas tubing and its connections, or from defective gas appliances, such as cooking stoves, hot-air heaters, so-called "instantaneous" hot-water heaters, and pressing irons. It has been repeatedly shown, where Bunsen burners are used for gas ranges or other appliances, that with increased pressure gas may escape through the air inlets of the burners. In the case of flaring gas flames some gas also escapes unconsumed.

Whenever gas flames come into contact with a cold object there is a possibility of imperfect combustion resulting in the formation of carbon monoxide gas. Thus Thorpe (64) has shown that an ordinary Bunsen burner heating a sand tray evolves about 0.022 cubic foot of carbon monoxide per hour. Hence, if a gas flame comes in contact with the cold surface of a cooking utensil, there arise conditions favoring the formation of carbon monoxide. Furthermore, when the soot which gradually collects around the coils of hot-water

heaters becomes incandescent, conditions become favorable for the formation of carbon monoxide.[1]

POISONOUS ACTION.

The poisonous action of carbon monoxide results, in the first place, from its power of combining with the hemoglobin of the red corpuscles of the blood to form a fairly stable compound, carbon monoxide hemoglobin, which interferes with the oxygen-carrying power of the hemoglobin and causes death by cutting off the oxygen supply to the tissues of the body; in the second place, it is said to have a direct effect upon the central nervous system, often a narcotic and depressing action, and may even produce paralysis.[2]

One of the serious features of carbon monoxide poisoning is that its action is insidious. Even very small amounts of the gas in the air will be taken up by the blood, thus proportionally diminishing its oxygen-carrying power. Carbon monoxide does its mischief secretly, so that it may take a long time before the gas accumulates in the blood in sufficient quantity to make its presence felt by

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[1] Rosenau (53) referred to a case in Washington where carbon monoxide from a water heater accumulated in a kitchenette to such an extent that three persons were overcome and death resulted. Glaister and Logan refer to a case reported by Ryberg (54) in which a fatal accident occurred due to the use of a badly constructed "geyser" or "instantaneous" heater for a bathroom. There was no chimney or pipe to carry away the combustion products and the small room was completely closed. One gas bracket was still lit, but the heater was extinguished. The victim was found dead in the bath, with her mouth under the water. There was no odor of gas, and examination of the blood showed the presence of a large amount of carbon monoxide. The heater being suspected as the cause of poisoning, it was lighted and kept burning for 19 minutes in the closed room, after which an analysis of the air showed 2.5 per cent carbon dioxide, 13.9 per cent oxygen, and 1 per cent carbon monoxide. The production of carbon monoxide increased with the consumption of oxygen. Thompson (63) mentions that out of 90 cases of acute illuminating gas poisoning which occurred in the course of his hospital service in New York, 18.8 per cent were fatal, and of these many were due to the careless use of gas stoves.

[2] In this connection Kobert (28) states: "That carbon monoxide has a direct action on the nervous system is shown in a marked manner when an atmosphere of oxygen with at least 20 per cent of carbon monoxide is breathed; for in the first minute there is acute cramp or total paralysis of the limbs, when the blood in no way attains the saturation sufficiently great to account for such symptoms. Geppert has, through special research, shown that an animal suffocated by withdrawal of oxygen increases the number and depth of the respirations; but when the animal is submitted to carbon monoxide, in which case there is quite as much a withdrawal of oxygen as in the former case, yet the animal is not in condition to strengthen its respiratory movements; Geppert rightly concludes that carbon monoxide must have a primary specific injurious action on the nerve centers. I (Kobert) am inclined to go a step further, and, on the ground of unpublished researches, to maintain that carbon monoxide not only affects injuriously the ganglion cells of the brain, but also the peripheral nerves (e. g., the phrenic), as well as various other tissues, as muscles and glands, and that it causes so rapidly such a high degree of degeneration as not to be explained through simple slow suffocation; even gangrene may be caused." Thompson (63) found that the effects of carbon monoxide on the nervous system were evident in cases where there were present a large percentage of red cells carrying oxygen. This condition has been known to persist long after the carbon monoxide has left the blood. According to Glaister and Logan (19), in many cases nervous lesions developed after repeated exposure to small quantities of carbon monoxide.

symptoms of illness. While the odor of illuminating gas which contains the odorless carbon monoxide will often give warning of the presence of a poisonous atmosphere, people often do not perceive an odor either because of its gradual development or because of colds or nasal catarrh. Fatal accidents have been known to occur when gas, leaking from a main, traveled through the soil, thereby losing its characteristic odor, and entered houses some distance from the break in the main, fatal poisoning being caused without persons in the building being warned by any odor of gas.

The affinity of hemoglobin of the blood for carbon monoxide is about 200 times greater than that for oxygen, so that, although there may be only a very small amount of carbon monoxide present in the air respired, the action of the gas is cumulative and up to certain limits the carbon monoxide is gradually but continuously taken up by the hemoglobin. When the blood has absorbed carbon monoxide to the extent of 20 per cent symptoms appear, though only on exertion, and consist of headache, slight giddiness, shortness of breath. Decided symptoms of poisoning are evident when the hemoglobin is about one-third saturated with carbon monoxide, and death occurs when it is over 60 per cent saturated. In investigating the relation existing between the time required to produce toxic symptoms and the carbon monoxide in a given atmosphere, Haldane found that the time required for a given amount of carbon monoxide in the air to produce toxic symptoms depended on the time required for producing a given degree of saturation of the hemoglobin of the blood. The human body has about 5 liters of blood, the red cells of which are capable of taking up 1 liter of carbon monoxide. To attain a one-third saturation of the blood would, therefore, require the inhalation of one-third of a liter of carbon monoxide, or 333 c. c. Since in normal respiration 7 liters of air are inhaled in a minute, if the contaminated air contained 0.1 per cent carbon monoxide, there would be inhaled in a minute 7 c. c. of carbon monoxide. To attain a carbon monoxide saturation of the blood to the extent of one-third, or to inhale 333 c. c. would, therefore, require about 47 minutes, or three-fourths of an hour.

If after exposure to carbon monoxide an animal, while alive, is taken into the fresh air, especially into oxygen, at an increased tension, the carbon monoxide is gradually eliminated from the blood. The elimination of carbon monoxide takes place through a process of dissociation of the carbon monoxyhemoglobin and by exhalation of the liberated gas through the lungs. Whereas the time required to produce carbon monoxide poisoning depends upon the rate of absorption of carbon monoxide by the hemoglobin of the blood, the time required to produce recovery from carbon monoxide poisoning, so far as elimination of the poisonous gas from the blood is concerned,

depends on the rate of dissociation of the carbon monoxide hemoglobin and the subsequent elimination of the carbon monoxide. Observers differ as to the length of time required to free the blood from carbon monoxide after exposure to this poison. According to Pouchet (43) the carbon monoxide in the blood of surviving persons could be detected as long as 60 hours after exposure to gas, whereas Koch (29) found it within 10 hours and Hofman (26) only within 2 hours. In this connection, as the result of investigation on animals, Wechse (65) concluded that the longer the period of exposure to carbon monoxide the longer was the period of time in which the gas could be shown present in the blood. He pointed out, however, that the individual peculiarities of animals are also a factor to be considered.

SYMPTOMS OF ACUTE CARBON MONOXIDE POISONING.

Where the persons are exposed to large amounts of carbon monoxide, among the symptoms of acute poisoning may be headache, ringing in the ears, throbbing of the temples, disturbances of vision, giddiness, especially after exertion, powerlessness of the lower extremities from a feeling of weakness and staggering up to complete paralysis, vomiting, marked shivering, chilly feelings and inability to keep warm, cutaneous eruptions, palpitation of the heart, breathlessness, oppression about the chest, tachycardia (greatly increased pulse rate), bradycardia (decreased pulse rate), vasomotor disturbances, such as flushing sensations of heat over the face, head, and neck followed usually by cold sweats, edema, albuminuria, glycosuria, loss of sensation in the hands or feet, derangements of the nervous system, such as weakening of memory, sight, hearing, disturbances of speech, neuritis, and in some cases even convulsions and severe inflammations of the upper air passages, as bronchitis and laryngitis.

CHRONIC CARBON MONOXIDE POISONING.

Chronic carbon monoxide poisoning, arising from continued breathing of small amounts of carbon monoxide, starts usually with symptoms similar to those of acute carbon monoxide poisoning, but differing in degree. Among some of the symptoms characterizing this slow and gradual poisoning are headache, pallor, progressive anemia, derangements of the digestive system, a slow pulse, mental dullness, fatigue after but little exertion, failing memory, palpitation of the heart, and a tendency toward difficulty in breathing.

CARBON MONOXIDE EXPERIMENTS.

ON ANIMALS.

Experiments on rabbits have shown that when an admixture of 5 per cent of carbon monoxide is added to ordinary air the animals quickly succumb, and die in convulsions within 10 minutes (Eulenberg). With an air mixture containing 3 per cent of carbon monoxide death sets in in about 20 minutes (idem). For rabbits the lowest fatal carbon monoxide atmosphere is in the neighborhood of 0.5 per cent. Gruber reports that deaths followed in rabbits on exposure to carbon monoxide concentrations of 0.4 per cent or more, though mixtures between 0.2 per cent and 0.4 per cent could be endured, with severe symptoms of stupor, for many hours. Mixtures containing from 0.1 to 0.2 per cent carbon monoxide soon produce, according to Gruber, dyspnea, uncertainty of movements, and disturbances of equilibrium, and yet this condition was endured for 10 hours without any increase in severity. The lowest amounts of carbon monoxide that were just sufficient to produce perceptible effects appeared to be from 0.07 to 0.08 per cent. With this carbon monoxide mixture Gruber observed in the animals an acceleration and shallowness of the respiration and general fatigue. This investigator also reported the case of a pregnant rabbit that breathed a mixture of from 0.044 to 0.059 per cent of carbon monoxide for 66 hours without the slightest apparent effect upon its health. Nowicki (39) found the lowest limit which produced symptoms of weakness in rabbits to be about 0.25 per cent.

CARBON MONOXIDE EXPERIMENTS ON MAN.

Experiments on the effect of various amounts of carbon monoxide on man are not as numerous as they might be. After breathing mixtures of carbon monoxide containing 0.021 and 0.024 per cent on two successive days for periods of three hours without experiencing either discomfort or ill effects, Gruber (21) concluded that at high dilutions carbon monoxide is harmless.

Fokker (17) in criticizing Gruber's experiments and conclusions maintained that prolonged breathing of the small amounts of carbon monoxide present in overheated rooms filled with tobacco smoke is one of the principal causes of the paleness and undernourishment of people leading sedentary lives and that it is erroneous to consider of hygienic importance only those amounts of carbon monoxide that produce visibly toxic effects.

Mosso (37) reported the results of his experiments on three men. In one case where the subject breathed from 0.02 to 0.05 per cent of carbon monoxide for 60 minutes, there were no observable ill effects.

Breathing 0.10 per cent carbon monoxide for 15 minutes somewhat retarded the respiration and accelerated the pulse. In an experiment of 30 minutes' duration, in the last 15 minutes of which the atmosphere contained 0.35 per cent carbon monoxide, there were no observable symptoms. After 55 minutes' exposure to 0.37 per cent carbon monoxide the subject felt a knocking in the temples and had vertigo and nausea. The same person during an experiment lasting 100 minutes, the last 22 minutes of which he breathed 0.43 per cent carbon monoxide, had no symptoms. In another experiment the same carbon monoxide content (0.43 per cent) was reached in 17 minutes, and produced, 12 minutes later, vertigo as the first symptom of poisoning. Fourteen minutes later, or 26 minutes after enduring a carbon monoxide content of 0.43 per cent, respiration was impeded and symptoms endangering life set in, so that the experiment was discontinued and artificial respiration with oxygen had to be used.

Another subject who breathed 0.3 per cent carbon monoxide for 50 minutes and 0.4 per cent for 40 minutes was affected in both instances by headache, vertigo, and vomiting. A third subject who inhaled 0.4 per cent carbon monoxide was more susceptible. After 25 minutes he had extreme difficulty in breathing, vertigo, and nausea. Mosso called attention to the similarity between carbon monoxide intoxication and illness caused by presence in a rarified atmosphere.

Burrell (4 and 5) exposed himself to an atmosphere containing 0.25 per cent of carbon monoxide for 20 minutes. He then had a slight headache. About an hour after the conclusion of the experiment he ate a light meal. About 15 minutes after eating he rapidly became ill. His headache increased. This was followed by nausea and severe vomiting. Retching was present long after the contents of the stomach had been expelled. He now suffered from violent headache. Recovery was not complete until 10 hours had passed. On another occasion Burrell breathed a similar atmosphere of carbon monoxide for 8 minutes without experiencing noticeable effects.[1]

Haldane (23) made a number of experiments upon himself, breathing definite mixtures of carbon monoxide and air for different periods of time. The carbon monoxide content of the blood was determined and observations were made of the effects produced on himself. Breathing a 0.5 per cent carbon monoxide atmosphere for 11½ minutes produced hyperpnea (abnormally active breathing). Inhalation of 0.39 per cent carbon monoxide for about 30 minutes was followed

[1] The additional details of these experiments, not given by Burrell in Technical Paper No. 11 of the United States Bureau of Mines, 1912, were obtained personally from this investigator.

by dizziness, palpitation of the heart, and difficulties in vision and respiration. A blood test showed 39 per cent of the hemoglobin to be saturated with carbon monoxide. Inhalation of 0.40 per cent of carbon monoxide for 24 minutes produced a 27 per cent saturation of the blood with this gas, and hyperpnea, together with slight giddiness after exertion. In one experiment he breathed for 29 minutes air containing 0.36 per cent of carbon monoxide. The symptoms were the same as those just above mentioned, together with a throbbing in the head and palpitation of the heart. A blood test showed 37 per cent of the hemoglobin saturated with carbon monoxide. An air mixture containing 0.12 per cent carbon monoxide breathed for 120 minutes produced a 37 per cent saturation of the hemoglobin with carbon monoxide, and was followed by the following symptoms: Hyperpnea, dull and "abnormal" feeling, and marked impairment of vision and hearing. Breathing an atmosphere containing 0.21 per cent carbon monoxide for 71½ minutes produced an exaggeration of the symptoms above mentioned and uncertainty of movements. The saturation of the hemoglobin with carbon monoxide amounted to 49 per cent. In one experiment Haldane breathed for 4 hours air which contained 0.045 per cent carbon monoxide. The symptoms were the usual hyperpnea, with slight palpitations. There was a 23 per cent saturation of the hemoglobin with carbon monoxide. An air mixture containing 0.027 per cent carbon monoxide (270 parts of carbon monoxide per million parts of air) was inhaled for 3½ hours. The hemoglobin was saturated with carbon monoxide to the extent of 14 per cent and no ill effects were observed, excepting a slight shortness of breath on exertion. Breathing 0.021 per cent carbon monoxide for 4 hours produced no noticeable symptoms. From the above it is seen that the smallest amount of carbon monoxide that produced noticeable effects on Haldane was 0.027 per cent, or 270 parts of carbon monoxide per million parts of air.

In considering what is the smallest amount of a poisonous gas which is injurious it should be remembered that it makes considerable difference whether the poisonous atmosphere is breathed occasionally for a comparatively short period of time, or whether the person is exposed regularly for fairly long periods of time, as is the case with a person working in an atmosphere where such poisonous gas is being constantly discharged into the air.

TOLERANCE TO CARBON MONOXIDE.

TOLERANCE IN ANIMALS.

With regard to the establishment of tolerance to carbon monoxide in animals the work of Nasmyth and Graham (38) is interesting. These investigators kept a number of guinea pigs in a gas chamber in an atmosphere of carbon monoxide sufficient to saturate 25 per cent of the hemoglobin of the blood. This treatment was continued daily for several weeks. As the animals were breathing an atmosphere in which they could use only 75 per cent of their hemoglobin for carrying oxygen to the tissues, it was thought that the health of the animals would be affected and that there would result a loss in weight and anemia. To the surprise of the investigators they found, on the contrary, that the animals were as lively as before and actually gained in weight. Examination of the blood at first showed degeneration of the red blood corpuscles. Normoblasts appeared as early as the third day, and the red blood corpuscles increased in number until a maximum was reached in three or four weeks. This increase in the number of blood corpuscles takes place to compensate for the loss in oxygen-carrying power of the blood. A similar compensation in the blood-forming organs occurs in high altitudes where the oxygen is rarer than at ordinary altitudes, and also after the body suffers a considerable loss of blood. Nasmyth and Graham then gradually increased the saturation of the hemoglobin with carbon monoxide until it was raised to 45 per cent. Exposure to these conditions made the animals ill and caused them to lose weight, but in four or five days they apparently recovered. Examination of the blood showed about the same phenomena as when the animals were first subjected to a carbon monoxide atmosphere. When normal guinea pigs were now exposed to an atmosphere sufficient to cause 45 per cent saturations of the hemoglobin with carbon monoxide, they would die in three or four days.

Oliver (40) has exposed dogs to 0.8 per cent of carbon monoxide in compressed air for several hours apparently without any bad effects.

In these experiments on the effect of different atmospheres of carbon monoxide, the action on the nervous system was not taken into consideration. It should also be remembered that because the animals tolerated given atmospheres of carbon monoxide for several weeks or months, it does not follow that they would not suffer in health when exposed to this atmosphere for much longer periods of time.

TOLERANCE IN MAN.

Susceptibility to carbon monoxide poisoning varies greatly in different persons. Although no individuals are immune to carbon monoxide poisoning, still there are persons who seem able to endure for a while an atmosphere which would render those more susceptible unconscious. Such so-called "gas-proof" men are sent out by some mining or other companies to attend to leaks or other accidents involving exposure to gas. Individual susceptibility or idiosyncrasy seems to be a very important factor in gas poisoning, as cases are recorded where only very short exposures to small amounts of carbon monoxide have proved fatal. There are also cases on record where persons who were seriously poisoned recovered rapidly, while others who at the time of exposure showed no serious symptoms of poisoning later developed serious aftereffects. Toleration to minute amounts of carbon monoxide may be established in some individuals, who will be able to remain at work in atmospheres which at first affected them sufficiently to produce symptoms of gas poisoning. On the other hand, there are persons in whom it seems toleration can not be established, and they soon get headaches, become anemic, suffer from palpitation of the heart and breathlessness, and display other symptoms of gas poisoning just so long as they continue to work in atmospheres containing some carbon monoxide.

In addition to individual susceptibility or idiosyncrasy the following factors are involved in the establishment of toleration to carbon monoxide poisoning: The length of exposure, the percentage of carbon monoxide gas present, increase in the amount of carbon dioxide or decrease in the amount of oxygen in the air, the age of the individual, the constitution, the depth of chest movements, amount of muscular exertion, the volume per minute of the circulation, addiction to alcohol, the sex, and the condition of health. Mention has already been made of the relation between the concentration of carbon monoxide and the time required to produce poisoning.

An abnormal increase in the amount of atmospheric carbon dioxide or abnormal decrease in the amount of atmospheric oxygen will render the individual more readily susceptible to carbon monoxide poisoning. So far as age is concerned susceptibility seems higher in the very young and the aged. As a rule, those with stronger physiques can withstand carbon monoxide poisoning better than those not so well built. Strong young men, however, are more easily affected by carbon monoxide than older men, as their activity is greater, and the volume of the circulation per minute consequently higher. This favors the more rapid absorption of a

larger quantity of the poison. In people of any age those exerting themselves most are the first to be overcome. Not only will increased muscular activity hasten the effect of carbon monoxide poisoning, but marked mental effort or mental distress, as anxiety or worry, will do so even quicker.[1]

The volume of the circulation per minute and perhaps, as Glaister and Logan suggest, the amount and the quality of hemoglobin are also factors to be considered in the matter of susceptibility to carbon monoxide poisoning.

According to Glaister and Logan, women do not stand chronic poisoning by small amounts of carbon monoxide as well as men, and it is they who are more subject to nervous aftereffects of the gas. In factories or shops into which carbon monoxide has penetrated, women seem to be the first to be affected. A factor in producing susceptibility to poisoning which, in the case of women, is usually negligible, is addiction to alcohol. Persons addicted to alcohol can not stand a carbon monoxide atmosphere as well as those who abstain from the use of alcohol.

Diseased conditions of the body, such as weakness of the nervous system, especially of the heart or lungs, generally renders the individual more susceptible to carbon monoxide poisoning. Since a person having a lesion of the lungs has only a part of his lungs available to get oxygen, and since under these conditions there is less hemoglobin available for carrying oxygen to the tissues, the person becomes more easily subject to the influence of carbon monoxide poisoning. Glaister and Logan mention the case of a tuberculous patient with considerable consolidation of the right lung, who, after working for three or four weeks about a gas-engine plant, complained of symptoms which could be directly referred to carbon monoxide poisoning. Instead of becoming habituated to the carbon monoxide atmosphere as he had been assured, he was becoming so sick that he was compelled to give up his work. On starting to work in the open air he quickly improved in health.[2]

WORK OF PRESSER OR IRONER.

NUMBER OF PRESSERS AFFECTED.

From the figures for the number of wage earners in the garment industry, as given by the United States census of 1910, it is estimated that there are about 400,000 garment workers in the United States. If the proportion of pressers or ironers to garment workers throughout the industry is about the same as it is in the garment

[1] Glaister and Logan.

[2] See Appendix B for summary of a case of wholesale chronic carbon monoxide poisoning reported by Morel and Mourlquand (6, 7, 35, 36).

industry under the jurisdiction of the Joint Board of Sanitary Control of the Cloak, Suit, and Skirt and the Dress and Waist Industries of New York City, which included over 85,000 garment workers in 1911 (10 per cent), then the number of pressers or ironers in the garment industry in the United States is approximately 40,000. Forty thousand pressers, together with many thousands of other workers associated closely with them in their work, are therefore directly concerned with the conditions of sanitation and industrial hazards mentioned in this report.

NATURE OF PRESSER'S WORK.

The work of the presser consists in hand ironing or pressing garments. The irons are rather heavy, averaging about 16 pounds in weight, and some of them weigh from 20 to 25 pounds. Overheated irons are cooled by immersion of the pressing surface into pails of water, and the steam arising from this process and from pressing moistened garments, together with the heat of the iron itself, often produces atmospheric conditions which almost sicken the pressers.

Whereas the general workers in the same room with the pressers may not be affected as much by leakage from artificial illuminating gas because the products of incomplete combustion of gas irons or leakage from tubing and connections is spread gradually through the room, the presser in the course of his work bends down over the pressing iron, and if that appliance is defective, or if there is gas leakage from tubing or connections, he, working nearest to the sources of air contamination, will be the first to suffer.

Generally there is no special room occupied by the pressers, who do their work on tables placed where they do not interfere with the work of the machine operators or finishers, who need most of the light, and who, as a rule, are located near the windows. Most of the pressing is, therefore, done in the middle of the loft or in corners of the shop. In the desire of the shop managers to keep the irons as hot as possible, the pressers are sometimes kept still farther away from the needed fresh air and light by partitions surrounding the pressing table.

CARBON-MONOXIDE POISONING OF PRESSERS.

That pressers or ironers are subject to health hazards of poisoning by carbon monoxide has been recognized by a number of investigators.

Arlidge (1), writing in England in 1892 on diseases of occupations, in referring to the use of hollow pressing irons heated by a jet of gas which is led to the iron by flexible tubes, pointed out the danger to the pressers of working in an atmosphere containing escaped gas and unhealthy products of combustion. In a report on industrial poisons issued by the French Government (41) in 1901, mention is made of a chronic form of intoxication by carbon monoxide

among pressers using hollow irons heated by charcoal, which brings about a weakening of vision, frequent syncopes on working and weakness in the muscular movements. Epstein (12), referring to the high amount of carbon monoxide given off from charcoal gas irons, says that not only do the pressers suffer with headache and dullness and other symptoms characteristic of gas poisoning, but that tailors and seamstresses working in the vicinity are also affected. Rambousek (44) mentions a case of poisoning in a Berlin laundry where gas irons were heated by gas under pressure. The gas used was made from charcoal, and the gas jets were in stoves from which the fumes were exhausted mechanically. This arrangement, which was considered satisfactory, was used for months before the mechanical ventilation got out of order. When this happened, 12 women suffered so severely from symptoms of carbon monoxide poisoning that is was necessary to resort to artificial respiration with oxygen. Glaister and Logan (19) refer to cases of paralysis that developed among cooks, laundry workers, ironers, and others, in which the patients were never sufficiently affected as to be overcome to the extent of becoming unconscious. These authors also state that Régis (45) called attention to the fact that in the acute forms of carbon monoxide poisoning a very prominent symptom is retrograde amnesia, and observed rapid and incurable dementia follow in prolonged chronic poisoning in ironers whose previous symptoms included vertigo, mental dullness, and hallucinations. Simpson (58) reports the case of an ironer who was the subject of attacks of vertigo, headache, and visual hallucinations when she awoke in the morning. She always felt worse after "glossing" and during drying. Glaister and Logan state that Molliet (34) called attention to the "frequency with which feebleness of vision, generally produced by congestion of the choroid, was met with in ironers in laundries, and he further noticed that in these cases this affection took a long time to cure." Sachs (55) mentions that he found among laundresses cases of pronounced anemia, accompanied by digestive disturbances, headache, and palpitation of the heart. These troubles quickly disappeared when the patients discontinued their occupation, but reappeared on their resuming it. He also reported cases showing a striking resemblance to chlorosis and other cases so aggravated as to suggest pernicious anemia.

Glaister (19) in his evidence before the departmental committee on compensation for industrial diseases in England in 1907 said: "I have noticed fresh, healthy young girls go into a laundry, and within six months become absolutely bleached, colorless, anemic, useless, and get knocked off work, and unless they were sent away to the country were apt to break down in health." It is mentioned by Glaister and Logan that Lancereau and others in reporting serious cases of chronic carbon monoxide poisoning held that such occurrences in cooks and ironers who were exposed to this gas during this work were not infrequent.

OTHER HEALTH HAZARDS OF PRESSERS.

Exposure to gas poisoning from carbon monoxide is not the only health risk the presser has to stand. The constant standing, the lifting and handling of heavy irons, the stooping forward, the exposure to the high degree of humidity due to evaporation from the pressed moist garments, and also from the high temperature resulting from the heated irons and garments, all contribute to make the operation of pressing garments fatiguing.

Hayhurst (24) refers to the fatiguing character of hand pressing or ironing, as attested to by the number of persons with fatigue neuroses particularly affecting the arms used who appear at dispensaries and hospitals. He states that often there is, in addition to the above, neuritis and partial paralysis.

A man who is physically weak can not long stand the strain of working under these strenuous and insanitary conditions. The result is that for this kind of work weaklings are eliminated at the start. Few men will apply for this kind of work unless they have fairly robust constitutions. Schereschewsky (56) in his physical examination of the workers in the garment industry found that few females worked as pressers, that male pressers as a class had the most robust physiques and stolid temperaments, and that no less than 40 or 50 per cent of their previous occupations entailed considerable muscular exertion and, therefore, required a vigorous physique. In his comparative study of the condition of the blood among the various groups of workers in the garment industry, Schereschewsky (56) found that the small group of miscellaneous workers with 88.5 per cent hemoglobin in the blood (Tallquist scale used) had the highest percentage of hemoglobin, while pressers were next with an average of 87 per cent, and then, in the following order, came operators with 86.8 per cent, cutters with 86.7 per cent, tailors with 86.2 per cent, and finishers with 86 per cent. Schereschewsky further states that, "although pressers had the highest average percentage of hemoglobin of the three large groups of workers, this group nevertheless furnished the worker in whom the lowest reading (65 per cent) found among males was recorded, and also had the greatest number of individuals (31 in 658 observations, or 4.7 per cent) in whom the hemoglobin was below 80, according to the Tallquist scale."

Examination of the air in the shops of the garment industry has shown that pressers are exposed to carbon monoxide poisoning from defective gas tubing, defective gas connections, and defective gas irons. That this is the case was also suggested by Rogers (51) in his report on Ventilation in the Cloak and Suit Industry. The present findings as to the danger of chronic carbon monoxide poisoning of pressers, therefore, is in accord with the results of the blood tests of pressers showing that the presence of carbon monoxide in the atmosphere of shops is a factor in producing the low hemoglobin in the blood of the pressers who work in closest proximity to the sources of air contamination from illuminating gas.

ELECTRICALLY HEATED PRESSING IRONS.

In view of the fact that electrically heated pressing irons remove all possibility of hazard to workers of poisoning by carbon monoxide gas, the adaptability of these irons for use in the garment trades should be considered. There are on the market electric irons that give thorough satisfaction. The safest thing for a prospective user of electric irons to do, however, is to consult the company furnishing him electric power with regard to the best appliances.

While a number of manufacturers of waists and dresses have adopted the use of electrically heated pressing irons, there seems to be an impression in the clothing trade that these irons are unsuitable for pressing heavy garments, because of being too light. This is an erroneous impression, for manufacturers of electric irons have made them sufficiently heavy to press cloaks, suits, and other heavy garments or material. (See fig. 27.)

Electric pressing irons are superior to gas-heated pressing irons in the following respects:

(1) As a result of the greater control of the proper temperature with the use of electric irons there is no overheating of the working room in the hot summer weather with the resulting discomfort and tired and depressed feeling incidental to working near overheated gas pressing appliances.

(2) In the case of electrically heated pressing irons, as no gas is used, it is impossible to have any harmful effects due to the escape into the working room of poisonous illuminating gas or any products of its incomplete combustion.

(3) Boards of fire underwriters often give lower insurance rates to users of electrically heated appliances than to users of gas-heated appliances.

SUMMARY.

The present investigation as to the hygienic conditions surrounding the use of gas-heated irons and accompanying appliances is part of an investigation of the health of garment workers undertaken by the Public Health Service at the request and with the cooperation of the Joint Board of Sanitary Control of the Cloak, Suit, and Skirt, and Dress and Waist Industries of New York City.

The investigation embraced—

(1) Air tests in shops of the garment industry with reference to the amount of carbon monoxide gas present and studies of the condition of gas-heated appliances in these shops.

(2) Laboratory tests of the gaseous combustion products of various kinds of gas-heated pressing irons.

FIG. 27.—ELECTRIC IRONS USED IN SHOPS OF THE GARMENT INDUSTRY IN NEW YORK CITY.

(3) Permeability tests of various kinds of flexible gas tubing used for conveying gas to the pressing irons, and of the gas connections between the gas tubing and the gas iron.

(4) The hygienic significance of the presence of small amounts of carbon monoxide in the air of confined inhabited places.

I. EXAMINATION OF AIR AND OF GAS APPLIANCES IN SHOPS.

Air samples.—Samples of air for analysis were secured from 244 shops. In 29 shops, or 11.8 per cent, the amount of carbon monoxide present in samples taken near gas-heated pressing irons was over 100 parts in a million parts of air, the average for these shops being 325 parts of carbon monoxide per million parts of air. The amounts actually present ranged from a minimum of 105 parts to a maximum of 1,431 parts of carbon monoxide. The contamination of air samples taken near windows, at points removed as far as possible from sources of contamination, was very much lower, the amounts of carbon-monoxide gas present ranging from a minimum of 2.4 to a maximum of 39.6 parts to the million of air. The average carbon-monoxide content for these 29 shops was 11.8 parts to a million parts of air.

The average amount of carbon monoxide present for the entire number of shops (244) was 55.4 parts for samples taken near pressing irons and 7.4 parts in the million parts of air for window samples.[1]

Gas odor.—An odor of gas was perceptible in 93 establishments, or 38 per cent of the total number inspected. In 29 shops where carbon monoxide was present in excess of 100 parts per million of air, a gas odor was noticeable in 27, or 93 per cent. Out of 55 shops having carbon monoxide present in amounts ranging from 25 to 100 parts to the million of air, a gas odor was noticeable in 40 instances, or in over 72 per cent of the total.

Ventilation.—No mechanical system of ventilation was used in any of the shops visited, natural ventilation through windows being relied upon. Electric fans were provided in only 6 per cent of the shops inspected. Of these, less than one-half used the fans. While windows were generally kept open during the warm weather, during the cold season almost all the windows were kept shut.

Gas tubing and gas-tubing connections.—In connection with gas-heated pressing irons, rubber tubing was used in 77 per cent of the shops inspected, while flexible metal tubing was used exclusively in 9 per cent. About 11 per cent use both rubber and flexible-metal

[1] In considering the results of these air tests, it should be remembered that the investigation was carried on in the open-window season. The supposition is reasonable that in the winter time, with closed windows, the conditions would be considerably worse.

tubing. Flexible-metal tubing, therefore, was used in about 20 per cent of the shops. Flexible-metal tubing was used in connection with "blower" irons in about 16 per cent of the shops.

Defective rubber tubing was found in use in 52 shops of the 244 inspected, or in 21.3 per cent of the total. Defective flexible metal tubing was found in 16 shops, or 6.5 per cent of the entire number examined. Both defective rubber and flexible metal tubing were found in 66 shops, or in 27 per cent of the total number, i. e., 1 out of less than 4 shops was using some kind of defective gas tubing.

Poor gas-tubing connections were found in 17 cases, or in about 7 per cent of the total number of shops inspected.

Gas irons.—Of the 244 shops inspected, 122, or 50 per cent, used ordinary gas irons only; 102 shops, or 41.8 per cent, used "blower" irons exclusively, i. e., irons heated by means of a mixture of gas and air under pressure; 6 shops, or 2.4 per cent, used electric irons only, while the remainder used miscellaneous irons. Defective gas irons were found in 21 shops, or 8.6 per cent of the total number.

Reinspections.—That the occurrence of abnormal amounts of carbon monoxide in the air of workshops was not fortuitous was shown by the results of reinspections. Of 10 shops in which the carbon monoxide at the first inspection was over 100 parts per million parts of air, 5 shops on reinspection still gave over 100 parts of carbon monoxide to the million. Of these 5 cases, 2 were found in which the carbon monoxide present on reinspection was more than twice as high as at the original inspection.

II. COMBUSTION PRODUCTS OF GAS-HEATED PRESSING IRONS.

Examination of the combustion products given off from ordinary gas-heated irons showed that the percentage of carbon monoxide (as determined by the cuprous chloride method) varied from 0 (in an improved type of atmospheric iron) to 2 per cent. The limit of sensitiveness of the method used for determination, however, was 0.1 per cent; anything less than 0.1 per cent was therefore reported as 0. The average amount of carbon monoxide found in the combustion products of 8 different makes of atmospheric gas irons in 48 tests was 0.57 per cent, and the average for each make of iron ranged from 0 to 1 per cent of carbon monoxide.

In the case of "blower" irons, analyses of the combustion products by the cuprous chloride method showed no carbon monoxide. Twenty tests were made on four different makes of blower irons. By using the more sensitive iodine-pentoxide method, however, small amounts of carbon monoxide were found in the combustion products of blower irons (48 and 64 parts per million parts of air) as well as in the combustion products of an improved type of atmospheric iron

(72 and 90 parts per million parts of air) which showed no carbon monoxide with the cuprous-chloride method. In these cases the amounts of carbon monoxide present were probably insufficient to produce symptoms of chronic poisoning.

III. PERMEABILITY TESTS OF GAS TUBING AND GAS CONNECTIONS.

Sixty-eight tests were made on the permeability to illuminating gas of 16 different kinds of gas tubing.

The results of these tests show (1) that none of the gas tubes tested was found to be gas tight; (2) that the walls of tubing through which illuminating gas had been passed before making a test are more permeable to the gas than in the case of brand-new tubing; (3) that rubber tubing is the least permeable to gas; and (4) that flexible metal tubing and "composition" tubing give considerable leakages of illuminating gas.

Rubber tubing.—Examination of new rubber tubing showed that no rubber tubing such as is used in connection with pressing irons in the garment industry is gas tight. The smallest diffusion was 0.0009 c. c. of carbon monoxide per foot of tubing per hour; the largest diffusion 0.0564 c. c. It was shown that, other things being equal, a decrease in the thickness of the wall of the tube accompanies an increase in permeability of the tube to gas.

The passage of gas through the tubes before testing for permeability resulted in increasing the amount of gas diffusing through the walls of the tube. Tests made on new rubber tubing so treated showed an increase in the permeability of the tubing from 23 to 33 times the original permeability.

Tests made on old rubber tubing which had been used in shops gave permeability results ranging from 40 to 320 times the permeability of new tubing of equivalent quality.

Flexible metal tubing.—Permeability tests on flexible metal tubing showed that new flexible metal tubing permits more gas to be diffused through its walls than new rubber tubing, and that flexible tubing through which gas was passed for 30 days (240 hours) before the test leaks considerably more than new rubber tubing similarly treated. Tests on samples of old flexible tubing which were being used in the garment industry and which appeared to be in good condition showed that such tubing leaked enormously.

"Composition" tubing.—Tests made on brand-new "composition" tubing in one case gave a permeability result (0.0014 c. c. of carbon monoxide per foot of tubing per hour) comparable to that of new rubber tubing and in the case of a similar tube, but with an outer cover of asbestos, a diffusion (0.168 c. c. of carbon monoxide per

foot of tubing per hour) was obtained which was 120 times greater than the result above mentioned.

Permeability tests made on these tubes of composition material, after passing illuminating gas through them for 60 hours, showed a great increase in the diffiusion through the walls of the tubes. Compared to the first of the tubes above mentioned, the diffusion here was 113 times greater, and compared to the second tube above mentioned, it was 50 per cent greater.

Permeability tests of gas connections.—Permeability tests were made on connections between rubber tubing and metal tubes, such as are used for leading the gas into a gas iron. The results of these tests on gas connections ranged from a leakage of 0.0014 c. c. to one of 0.6174 c. c. of carbon monoxide per hour, the average being 0.3117 c. c. of carbon monixide per hour.

Jointed rubber tubing.—Specimens of jointed gas tubing made up of two pieces of rubber tubing connected by a short piece of metal tube were obtained from shops in which they were being used. Permeability tests on the joints of these tubes showed diffusions of carbon monoxide ranging from 0.4768 c. c. to 0.8360 c. c. per hour.

IV. HYGIENIC SIGNIFICANCE OF SMALL AMOUNTS OF CARBON MONOXIDE.

The quantities of carbon monoxide found in some of the shops studied in this investigation are sufficient to produce symptoms of chronic poisoning in pressers, for it has been shown that in some instances the amount of this gas present in the vicinity of pressing irons was over 1.4 parts per thousand parts of air.

It has been further pointed out in the course of the report that, even when the amounts of carbon monoxide present in the air are insufficient to produce visible symptoms of illness, nevertheless the injurious effect of the poison continues, as it puts out of action many of the oxygen-carrying blood cells, thus depriving tissues of their needed sustenance and undermining the nervous centers because of oxygen starvation. Continued exposure to these small amounts of carbon monoxide in time lowers the vital resistance of the body, thus inviting the onslaught of disease.

CONCLUSIONS.

1. The sources of the undue amounts of carbon monoxide found in the air of workshops are: (*a*) Incomplete combustion of illuminating gas in pressing irons; (*b*) leakage through the walls of hose used to convey gas: (*c*) leakage through defective connections to gas irons and gas pipes.

2. In addition to leakage caused by structural defects atmospheric gas-heated pressing irons may contaminate the air (*a*) by the partial

clogging of one or more openings in the gas burner by pieces of material rubbed off from the end of the tube conveying gas to the iron; (*b*) by "flashing back" of the burner flames.

3. While combustion is much better in blower than in atmospheric irons, the former have the following objectionable features: (*a*) Faulty connections permit the escape of gas: (*b*) the mixture of gas and air is not always easy to regulate; (*c*) the irons are noisy.

4. The use of electrically heated pressing irons removes the danger of exposure to carbon monoxide gas poisoning.

5. The walls of tubing used for conveying illuminating gas are not completely gas-tight.

6. Rubber tubing is the least permeable to illuminating gas.

7. Flexible metal tubing and cheap "composition" tubing are unsuitable for conveying a gas so poisonous as artificial illuminating gas.

8. The use of jointed or pieced rubber tubing is unsafe because of frequent looseness of the connection.

9. The rubber ends used to make connections in gas tubing are a more important source of gas leakage than the ordinary defective gas tubing.

10. The use of gas-tight metallic hose couplings for gas appliances is necessary in order to prevent gas leakage from hose connections.

11. The conclusion is justifiable that garment workers are liable to chronic poisoning by carbon monoxide gas.

12. Pressers are the class of garment workers the most exposed to the hazards of chronic poisoning from carbon monoxide.

13. A system of regular inspection and maintenance is necessary in order to insure proper hygienic conditions in the use of gas-heated appliances in workrooms.

14. Standards enforced by regulation are necessary for the construction of gas fixtures and gas-heated appliances, so that intrinsically defective gas appliances may not be used in the transmission of gas.

15. Education of workers in the use of safety precautions is necessary, so that they may avoid the danger of gas poisoning and exposure to air impurities. Particular emphasis should be laid on the means of securing proper ventilation in living and work rooms, and attention should be called to the fact that it is far better to remove than to minimize a health hazard.

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APPENDIX A.

HISTORICAL REVIEW OF METHODS FOR THE DETERMINATION OF CARBON MONOXIDE BY MEANS OF IODINE PENTOXIDE.

Ditte.—In 1870 Ditte (4)[1] observed that when iodine pentoxide is heated to a temperature of 150 to 200° C., it is decomposed as follows:

$$I_2O_5+5CO=I_2+5CO_2.$$

De La Harpe and Reverdin.—De La Harpe and Reverdin in 1888 (23) used this observation as the basis for a qualitative method for detecting carbon monoxide. First they passed the air through a glass wool, or cotton filter, then over pure iodic acid warmed to 150° C. in an oil bath, and finally into a solution of starch in distilled water. They called attention to the necessity of removing and excluding reducing agents. They stated that, with 9 liters of air containing from 1 to 2 parts of carbon monoxide in 100,000 parts of air, they obtained in about 20 minutes a very sensitive coloration.

Hélier.—Hélier in 1896 (19) in a thesis developed under the direction of Gautier applied this reaction quantitatively. Hélier passed the gas under examination first into a U tube containing glass beads saturated with iodine bromide to hold back ethylene, then into a U tube containing ammoniacal silver nitrate to hold back acetylene, after that into U tubes containing glass beads saturated with potassium hydroxide, and finally through sulphuric acid.

When the gas freed from interfering substances was passed at 60 to 65° C. into a U tube containing pieces of asbestos mixed with iodine pentoxide, only the carbon monoxide was oxidized, and this was received into a tube prepared according to the procedure of Muntz (32), who collected the carbon dioxide formed in a solution of potassium hydroxide, liberated the carbon dioxide with sulphuric acid, and then measured the volume of carbon dioxide over mercury. Gautier, by using the observations of Hélier, was able to determine 1 part of carbon monoxide in 10,000 parts of air.

Nicloux.—In 1898 Nicloux (34), unacquainted with the work of Hélier and Gautier, published an article in which he believed there was described for the first time the use of iodine pentoxide for the

[1] Bibliography follows article.

quantitative determination of carbon monoxide. Later he learned that Gautier had previously applied this method quantitatively.

Nicloux used iodine pentoxide at a temperature of 150° C. to oxidize the carbon monoxide and determined the amount of carbon monoxide by the depth of color that the liberated iodine gave with chloroform, or with carbon-disulphide solution, as compared to the depth of color obtained in standard tubes of iodine in chloroform solution. He purified his gas mixture by passing it over caustic potash to remove carbon dioxide, hydrogen sulphide, and sulphur dioxide, next over sulphuric acid to remove the moisture, and caught the iodine liberated from the iodine pentoxide in a solution of sodium hydroxide. He then liberated the absorbed iodine by treating the alkaline solution with sulphuric acid and sodium nitrite. By this method Nicloux was able to determine carbon monoxide in air in proportions of $\frac{1}{1000}$ to $\frac{1}{50000}$.

Gautier.—Gautier (7) in the same year referred to the fact that he first estimated carbon monoxide from the increased weight of copper filings over which he allowed the liberated iodine to pass, but later preferred to estimate the carbon dioxide which formed according to the procedure of Muntz previously referred to. Gautier criticized Nicloux's colorimetric estimation of iodine on the ground that the reduction of iodates by nitrous acid in presence of sulphuric acid is not instantaneous in the cold and is not reliable with certain dilutions of nitrous acid.

In a later article Gautier (8) stated that he tried the determination of small amounts of carbon monoxide by absorption with cuprous chloride, ammoniacal silver nitrate, gold chloride, and also by oxidation with potassium permanganate, chromic oxide, damp silver oxide, and mercuric oxide, but the results were unsatisfactory. He suggested absorbing the carbon monoxide formed in the reaction with titrated barium hydroxide solution and estimating the carbon monoxide from the amount of carbon dioxide.

Gautier (9) in the same year published another paper reporting that the iodine-pentoxide reaction started before 30°, that it was active at 40 to 45°, and was complete at 60 to 65°. As to interfering substances, he found that acetylene was already oxidized at the expense of the iodine pentoxide at 35°, no matter what the dilution of the carbon monoxide with the air might be, that ethylene was oxidized at 65°, even if diluted with air, while hydrogen, methane, ethane, and, in general, hydrocarbons of the same series were not oxidized at 60 to 80° by iodine pentoxide. However, in determining the amount of carbon monoxide present in city air, he stated that the amount of unsaturated hydrocarbons ordinarily present does not sensibly affect the determination. In additional communications Gautier (10 and 11) described some modifications of his

method. He recommended heating the iodine pentoxide before use in a dry current of air at 220°. He then filtered his air through glass wool, passed it successively through caustic potash solution, a solution of barium hydroxide, anhydrous phosphorus pentoxide, then over straight tubes of iodine pentoxide and reduced copper powder. Both of these tubes were heated in an oven at 100° C.

Smits, Raken, and Terwogt.—In 1900 Smits, Raken, and Terwogt (41) proposed the use of iodine pentoxide for the volumetric determination of carbon monoxide in illuminating gas. They filled a tube similar to a Hempel palladium pipette with alternate layers of iodine pentoxide and asbestos. After removing from the gas the carbon dioxide, illuminants, and oxygen in the usual way, using the Hempel apparatus, they passed the residual gas into the iodine pentoxide tube heated to 150° to 180° C., allowed the iodine to sublime within the tube and then determined the carbon monoxide present, from the contraction in the volume of gas after the carbon dioxide formed in the reaction was absorbed in the caustic potash pipette. They obtained satisfactory results that agreed within 0.1 per cent, using a mixture of 8 c. c. of carbon monoxide and 42.8 c c.. of methane, and with another mixture of 8.8 c. c. of carbon monoxide and 72.6 c. c. of hydrogen.

Kinnicutt and Sanford.—In the same year Kinnicutt and Sanford (22) reported that they could not make accurate determinations of small amounts of carbon monoxide by either of the methods of Nicloux or Gautier, but obtained satisfactory results by determining the iodine set free after absorption with potassium iodide solution by titration with a N/1000 solution of sodium thiosulphate. Contrary to Gautier's experience they found that the reaction with iodine pentoxide was not quantitative below 150°.

To remove unsaturated hydrocarbons, hydrogen sulphide, sulphur dioxide, and similar reducing gases, they first passed the sample through two **U** tubes, one containing sulphuric acid and the other small pieces of caustic potash. The air in the sample bottle was displaced by mercury and was then passed through the tube at the rate of about 1 liter in two hours. The authors found the method capable of determining as little as 0.0025 per cent volume of carbon monoxide or 25 parts of carbon monoxide per million parts of air, using a 1-liter sample.

On analyzing air mixed with illuminating gas they found that unsaturated hydrocarbons, hydrogen sulphide, and sulphur dioxide in much larger quantities than are contained in illuminating gas or formed by its combustion, were perfectly absorbed when passed through the **U** tubes mentioned. Hydrogen and methane had no effect on the iodine pentoxide at 150° C.

Fillunger.—In determining the carbon monoxide present in mine air, Fillunger (5) in 1903 stated that he used the method of Moltersky and Nowicki.[1] The air sample, freed from carbon dioxide and moisture by passage over barium hydroxide and soda lime, was passed over iodine pentoxide at 120° to 150° C. The liberated iodine was retained by passing it over silver, and the carbon dioxide formed in the reaction was absorbed with an excess of standard barium hydroxide solution. A gas mixture of carbon monoxide and air gave 1.043 per cent carbon monoxide, whereas combustion with copper oxide gave 1.053 per cent. Their results agreed within from 0.01 to 0.1 per cent of the theoretical values.

Thorpe.—In the same year Thorpe (43) studied the possibility of air contamination by carbon monoxide as a product of combustion by the Bunsen burner. He reported good results with the iodine pentoxide method, using as little as 0.0025 per cent of carbon monoxide.

Lévy and Pecoul.—In 1905 Lévy and Pecoul (25) used Nicloux's method for determining the amount of carbon monoxide from the intensity in color imparted to iodine by a solvent, but instead of absorbing the iodine in carbon disulphide they used chloroform. They heated the iodine pentoxide to 80° C., as indicated by Gautier. Using this method with a sample of 4 liters of air, they were able to show the presence of 5 parts of carbon monoxide per million parts of air. In another communication the following year (26), they found that the presence of small amounts of acetylene does not seriously interfere with the method. One part of acetylene in 10,000 parts of air gave a faintly perceptible color which did not even correspond to that of 5 parts of carbon monoxide per million parts of air on their color scale. They therefore concluded that in examining air of cities for carbon monoxide the possible presence of acetylene as an interfering substance might be disregarded.

Gautier and Clausmann.—In 1906 Gautier and Clausmann (15) took up a study of the volumetric determination of carbon monoxide by means of cuprous chloride. They found that after absorbing the carbon monoxide by cuprous chloride in the usual way it was always possible to determine the carbon monoxide which was not acted upon by passing the residual gas over iodine pentoxide at 70° C. They also found that when carbon monoxide was diluted with an inert gas it did not burn completely when exploded with an excess of oxygen. They concluded that the iodine pentoxide method was the only one which gave correct results.

[1] This method is similar to that of Kinnicutt and Sanford, but instead of using the iodine liberated as a measure of the amount of carbon monoxide, they determined the carbon dioxide produced.

Nowicki.—Nowicki (35) in 1906 found that the decomposition of iodine pentoxide began at 165° C., and was complete at 300° C., while the oxidation of carbon monoxide began at 45° C., and the reaction was complete at 88° C. Acetylene acted but incompletely at 85° C., and was removable by concentrated sulphuric acid or copper sulphate solution acidulated with sulphuric acid. After passing through a purifying train of caustic potash solution and a drying tube of calcium chloride and soda lime, the gas was passed over a U tube containing the oxidizing agent heated in a paraffin bath at 120 to 125° C. One side of this U tube was filled with iodine pentoxide, the other with pieces of silver to retain the liberated iodine. The carbon dioxide liberated in the reaction was absorbed in an excess of barium hydroxide solution and titrated with standard oxalic acid solution. Results by this method for amounts of carbon monoxide varying from 0.01 per cent to 1.5 per cent gave differences of from 0.001 per cent to 0.007 per cent, as compared to results obtained by combustion over copper oxide.

Nowicki preferred benzol to carbon disulphide or to chloroform as a solvent for iodine for colorimetric determinations of carbon monoxide. He referred to the difficulty of getting good results with colorimetric methods and suggested the use of a colorimeter. Using arsenious acid to titrate the liberated iodine, in samples containing from 0.013 per cent to 0.052 per cent of carbon monoxide, he obtained results that agreed within 0.003 per cent of the theoretical values. Nowicki also determined carbon monoxide by measuring the electrical conductivity of a solution containing the carbon dioxide obtained from the oxidation of carbon monoxide, but found this method too complicated.

Toth.—Applying the iodine pentoxide method to the determination of carbon monoxide in tobacco smoke, Toth (44) in 1907 filtered the dried gas through cotton wool and after purification by successive passage over 10 per cent caustic potash, barium hydroxide, sulphuric acid, and quicklime passed the gas over iodine pentoxide heated in a glycerine bath at 60 to 70° C.

Morgan and McWhorter.—In 1907 Morgan and McWhorter (30) modified the method of Kinnicutt and Sanford by passing the iodine free gas, after absorption in potassium iodide solution, through a long test tube (24 by 2.5 cm.) containing 50 c. c. of the barium hydroxide used for the determination of carbon dioxide in air by Hesse's (21) method, and found the amount of carbon dioxide absorbed by titrating the excess of alkali with standard oxalic acid solution, using phenolphthalein as indicator.

In this connection Dennis (3) suggested as an improvement the use of a glass cylinder, about 20 cm. high and 4 cm. internal diam-

eter, fitted with a three-hole rubber stopper carrying an inlet tube, an outlet tube, and the tip of a burette. By this arrangement the solution of barium hydroxide could be titrated without transferring it to another container, thus saving it from exposure to the air. Morgan and McWhorter refer to the importance of using sealed joints in connection with the iodine pentoxide tube to prevent entrance of organic matter. When at first they used an ordinary U tube with side arms and ground-glass stoppers they experienced the difficulty of having the iodine undergo spontaneous decomposition from the entrance of vapors from lanolin used to seal the ground-glass joints, and from glycerine or oil vapor. This difficulty was removed on sealing in a blast lamp the open ends of the U tube after filling it with iodine pentoxide.

Combining the methods of Nicloux and Gautier, Morgan and McWhorter obtained a double check in the estimation of carbon monoxide, determining both the iodine and the carbon dioxide formed from the decomposition of the iodine pentoxide. By placing a tube containing standard barium hydroxide solution before the iodine pentoxide, they could determine both the free carbon dioxide and the carbon dioxide formed in the reaction. Results of two analyses are given for air containing about 0.08 per cent carbon monoxide. Iodine titration results gave values greater by 0.0007 per cent and 0.0021 per cent than the amounts taken, while carbon dioxide titration results gave values in one case greater by 0.0047 per cent and in the other less by 0.0018 per cent than the amounts taken.

Nesmyelov.—Nesmyelov (33) in 1907 verified Nicloux's statement regarding the influence of organic dust in liberating iodine from iodine pentoxide. He could not get accurate results with Nicloux's colorimetric method for determining carbon monoxide, but obtained satisfactory results using the method of Kinnicutt and Sanford. Nesmyelov, after passing his gas sample successively over sticks of caustic potash, pumice stone saturated with sulphuric acid, and iodine pentoxide heated to 150° C., determined the iodine by absorption in a known amount of N/10 sodium thiosulphate and titration with N/10 iodine. Experiments with mixtures of hydrogen and methane, using the titration method, showed no interference of hydrogen or methane at the temperature of the reaction.

Nesmyelov reported experiences with Fodor's method for quantitatively determining carbon monoxide by the use of palladious chloride and concluded that the method was not suitable for highly accurate results, but only for qualitative work. He recommended the fractional combustion method for the removal of other hydrocarbons that have a tendency to react with carbon monoxide.

Nesmyelov condemned the use of silver oxide as an oxidizing agent for the separation of carbon monoxide, hydrogen, and methane,

first, because the carbon dioxide formed in the reaction unites with some of the silver oxide, and, second, because the silver oxide is reduced by the action of hydrogen. For the same gaseous mixture, however, he recommended combustion over palladious asbestos when the passage of the gases is not too rapid, e. g., when the rate of aspiration is about 1 liter per hour. He reported good results for combustion over copper oxide at 250° C., and stated that at that temperature methane was not involved in the reaction and that the rapidity of the passage of the gas mixture was of no importance.

Weiskopf.—Weiskopf in 1909 (45) reported that while ordinary sulphuric acid did not hold back olefines, this could be effected by the use of 99 per cent to 99.5 per cent sulphuric acid heated to 165° C. He passed his gas mixture successively through a purifying train consisting of (1) a U tube with glass wool and pumice stone saturated with sulphuric acid, (2) Liebig bulbs filled with 99 per cent sulphuric acid at 165° C., (3) a sulphuric acid spiral, (4) a caustic potash bulb, (5) a sulphuric acid spiral, and (6) a U tube with pumice stone saturated with sulphuric acid.

The iodine pentoxide was contained in a spiral tube with tight ground-glass joints, thus obviating the use of a lubricant, and was heated in an oil bath to 150°. The delivery tube from the iodine pentoxide tube dipped directly into an absorption tube containing 5 cc. of a 15 per cent solution of potassium iodide. The gases were finally dried in a U tube and the carbon dioxide formed in the reaction caught in an absorption flask. In a gas mixture containing 0.999 per cent volume of carbon monoxide and 4 per cent volume of carbon dioxide, together with approximately known quantities of methane, ethylene, hydrogen, nitric monoxide, oxygen, and nitrogen, he found 0.97 per cent volume of carbon monoxide and 4.11 per cent volume of carbon dioxide.

Goutal.—In 1910 Goutal (16) described a portable form of apparatus which he used. The iodine pentoxide mixed with glass wool was contained in a straight tube and maintained there at 200° in a current of pure dry oxygen for several hours. As a purifying train he used a tube of cotton wadding and wash flasks or U tubes containing successively a slight acid solution of copper sulphate, 15 per cent caustic potash, and pumice stone saturated with sulphuric acid. To remove unsaturated hydrocarbons, the air was passed successively through concentrated sulphuric acid, bromine, and caustic potash; in general, however, Goutal found this procedure unnecessary.

The iodine pentoxide was heated in a water bath kept at 75° by the flame of an alcohol lamp. To prevent condensation of small quantities of the iodine at the end of the tube, this was heated for periods of about a minute from time to time by the alcohol lamp.

Air was aspirated through the apparatus at the rate of about 1 liter per hour and the carbon monoxide determined colorimetrically by the depth of color that the liberated iodine imparted to a chloroform solution, or in case sufficient iodine was present, it could be determined by titration with sodium thiosulphate. A detailed method is given for the establishment of the iodine chloroform color standards. If the chloroform is only very faintly colored (which is the case with a carbon monoxide content below 0.005 per cent) the aspirator is again filled with water and the operation renewed until the development of a tint sufficient to render possible a colorimetric determination. With this method Goutal was able to detect 10 parts of carbon monoxide in a million parts of air without the need of aspirating more than two liters of air.

Gill and Bartlett.—Gill and Bartlett, in 1910 (17), repeated the work of Smits, Raken, and Terwogt, but could not confirm their findings. In attempting to apply the iodine pentoxide method to the determination of carbon monoxide in illuminating gas, using known amounts of carbon monoxide varying from 21.8 c. c. to 25.9 c. c., in five analyses they obtained but one result which checked, while in the four others there were losses of from 1 per cent to 4.3 per cent of the total amount used. The time of passing the mixture through the iodine pentoxide, which was heated at temperatures between 150 and 161° C., was from 29 minutes to 2½ hours.

In mixtures of carbon monoxide, hydrogen, and methane, corresponding approximately to the composition of the residual gas after carbon dioxide, "illuminants," and oxygen had been removed from the illuminating gas, an excess of from 3.1 per cent to 18.6 per cent more carbon monoxide was found over that originally present in the mixture. Gill and Bartlett could not account for these irregular results, other than by the possibility of the iodine pentoxide undergoing spontaneous decomposition.

Levy.—In 1911 Levy (25), in seeking a rapid method for estimating carbon monoxide, aspirated the gas through a gold chloride solution and measured the amount of the gas from the intensity in color of the reduced gold chloride. He abandoned the method as unsatisfactory and experimented with a portable form of apparatus using iodine pentoxide.

The gas for analysis was passed successively through bromine in potassium bromide to remove unsaturated hydrocarbons, caustic potash to remove carbon dioxide, a drying tube of phosphorus pentoxide, then through two U tubes, one containing iodine pentoxide mixed with small pieces of asbestos which had been previously ignited and the other with copper turnings to retain the liberated iodine. These two U tubes were heated in an air oven to 160–180° C. Aspiration of air through a fixed volume of standard barium hydroxide solution

colored by phenolphthalein was continued until just enough carbon dioxide, liberated in the reaction, had passed through the apparatus to neutralize and decolorize the barium hydroxide solution.

From the volume of air passed through the apparatus to effect decolorization and from the strength of the barium hydroxide solution, the percentage of carbon monoxide was calculated. Results given for mixed coal gas and water gas containing from 12 to 17 per cent of carbon monoxide, and for these gases diluted to from 0.8 per cent to 1.7 per cent of carbon monoxide, showed low values for the latter. An error of 0.3 per cent was reported.

Chance.—In the same year Chance (2) in examining mine air used the method of Kinnicutt and Sanford with a few slight modifications. A copper can containing the air sample was placed in a vertical position, and so arranged that water entered through the bottom tap. As it rose, the contained air passed through the upper tap into an absorption train. This consisted of a U tube, the first leg of which contained calcium chloride, the second soda lime. As practically no unsaturated hydrocarbons were present in mine air, a sulphuric acid tube was dispensed with.

The sample next passed through the iodine pentoxide tube, which was heated in a sand bath kept between 150° to 160° C. in a Bowen absorption tube containing 5 c. c. of a 10 per cent solution of potassium iodide. The gas was passed through the apparatus at the rate of about 1 liter per hour, 1 liter of air being the quantity usually analyzed.

Marcelet.—Marcelet (28) in 1911 made determinations of the amount of carbon monoxide in tobacco smoke. In using the Lévy and Pecoul procedure he found that a large part of the iodine liberated from the iodine pentoxide was deposited in parts of the tube emerging from the air bath. Marcelet obtained only very small quantities of carbon monoxide by this method in atmospheres previously analyzed by gasometric methods. He observed the same deviation in the analyses of laboratory illuminating gas by the two methods. He attributed the low results to an incomplete reaction due to insufficient thickness of the layer of iodic acid traversed. However, on greatly diluting the gas from tobacco smoke he was able to get concordant results using iodine pentoxide.

Herman.—In 1913 Herman (20), in making analyses of carbon monoxide in the air, used arsenious acid as an absorption liquid for the iodine liberated from iodic acid. Nowicki in 1906 had titrated the free iodine with arsenious acid. Herman absorbed the iodine given off from the reaction in a known excess of standard arsenious acid and titrated back the excess of the acid with a N/100 iodine solution. After passing the gas mixture through U tubes of caustic-potash solution, pumice stone saturated with sulphuric acid, and iodic acid

warmed to about 110° C. in a bath of ammonium sulphate, he caught the liberated iodine in one or more Winkler tubes containing arsenious acid. The gas was aspirated through the apparatus at a rate not exceeding 1 liter per hour. In order to carry over the last traces of liberated iodine, Herman found it necessary to pass a current of pure air through the apparatus for five hours. In working on mixtures of air and pure carbon monoxide, using 5 liters of the sample, he was able to determine only 1 part of carbon monoxide in 10,000 of the air mixture.

Burrell and Seibert.—In a publication of the United States Bureau of Mines, in 1913, Burrell and Seibert (1) described some new modifications in the apparatus for determining carbon monoxide. These included an electrically heated, wire-wound jacket for holding the iodine pentoxide tube and the use of a bulb burette for measuring the sample. The bulb burette consisted of eight bulbs, each having a capacity of 100 c. c., joined together by a narrow graduated constriction between each bulb, permitting measurements to be accurately made at atmospheric pressure by means of a leveling bottle. A constant temperature of 150° C. was maintained by the use of a thermocouple, which was placed inside the straight iodine pentoxide tube. The carbon dioxide produced in the reaction was absorbed by a standard solution of barium hydroxide and the excess was titrated with an oxalic acid solution containing 0.56325 grams per liter.

The purifying train consisted in general of the following arrangement: (1) Pumice stone and sulphuric acid, (2) lead acetate for retaining hydrogen sulphide if present, (3) a standard solution of barium hydroxide for retaining any carbon dioxide in the sample, (4) pumice stone and sulphuric acid, (5) fuming sulphuric acid, (6) concentrated sulphuric acid, (7) potassium hydroxide solution, (8) concentrated sulphuric acid. A guard tube containing soda lime was placed between the flask containing the standard barium hydroxide solution and the aspirator bottle.

Before making determinations, Burrell and Seibert passed air for several hours over the iodine pentoxide heated to 200°. At the conclusion of an experiment air was passed through a purifying train of caustic potash solution and a tube of soda lime.

These investigators found that in "after-damp" following mine explosions, in air vitiated by the firing of explosives in mines, or in air vitiated by the exhaust from gasoline locomotives, etc., wherever the carbon monoxide is present in amounts less than 0.2 per cent, gases other than carbon monoxide that reduce iodine pentoxide are seldom present in sufficient quantity to necessitate the use of the long purifying train above described.

In a mixture of carbon monoxide and air containing 0.04 per cent of carbon monoxide as determined by a combustion analysis made

with a modified Haldane apparatus, the analysis by the iodine pentoxide method using 800 c. c. of sample gave 0.043 per cent of carbon monoxide. The authors state that they obtained good results with mixtures of illuminating gas and air. In the case of an analysis where they used a mixture of carbon monoxide, methane, and hydrogen, the gaseous mixture being passed over a purifying train consisting of two wash bottles of concentrated sulphuric acid and two of caustic potash solution, the time required for the determination was about two and a half hours. The greatest difference in such a mixture between the results of combustion analyses and the iodine pentoxide method was 0.018 per cent.

Seidell.—In 1914, as a preliminary to a study of the gaseous impurities in the air of railway tunnels, Seidell (37, 39) took up the determination of carbon monoxide. His principal contribution to the technique of this determination consisted in the use of an improved form of absorption bulb for absorbing constituents from gaseous mixtures. As stated by Seidell (38) these bulbs have the following advantages: (1) A small air space, thus diminishing the amount of air that has to be swept through the apparatus for purification purposes; (2) the contents of the bulbs are easily transferable at the completion of an analysis; (3) the bulbs can be easily cleaned; (4) the series of three small bulbs composing one set of this absorption apparatus readily permits observation of the efficiency of the absorption; thus, where potassium iodide and starch are used in the absorption bulbs, the absence of a blue color in the last bulb shows that no iodine has passed beyond the first and second bulbs; (5) these bulbs can be readily made in the laboratory, but little experience in glass blowing being required.

The gas under examination, displaced from the sample bottle by water entering at the rate of about 2 to 3 liters per hour, was passed through a purifying train of sulphuric acid and potassium hydroxide, and then over iodine pentoxide heated in an oil bath at 150° C. The liberated iodine was absorbed in a 1 per cent potassium iodide solution containing 0.5 c. c. of 0.5 per cent arrowroot starch solution and titrated with N/1000 sodium thiosulphate. The carbon dioxide liberated was absorbed in standard barium hydroxide solution. The titration of the latter could therefore serve as a check on the results with the former.

Blank determinations with mixtures of 2,500 c. c. of carbon monoxide and air containing from 36 to 360 parts of carbon monoxide per million parts of air gave an analysis from 88 to 98 per cent of the original amounts. While relatively this appears to be a large loss, if the very minute quantities of gas are taken into consideration, these differences are really small. More accurate results are reported

for carbon monoxide determined by titration of the iodine liberated than by titration of the liberated carbon dioxide.

Sinnatt and Cramer.—Sinnatt and Cramer (40) in 1914 criticized previous methods of determining carbon monoxide, based on absorbing the liberated carbon dioxide by barium hydroxide, because of the time required to obtain perfect absorption of the carbon dioxide by the barium hydroxide solution, the uncertainty arising from the action of dilute solutions of barium hydroxide on the glass during a long period, the prevention of contact with the air and breath of the experimenter, and the difficulty of titrating the reacting liquid at the completion of an estimation.

Their method depends on the collection of the whole of the carbon dioxide after the carbon monoxide has been oxidized with iodine pentoxide. The gas was collected in a dry flask, which admitted of the carbon dioxide present being determined by Pettenkofer's process. A known volume of the gas was drawn through wash bottles containing fuming sulphuric acid, aqueous potassium hydroxide, concentrated sulphuric acid, then through two long tubes containing solid potassium hydroxide, so as to remove any unsaturated hydrocarbons, carbon dioxide, and moisture. The gas then passed through a tube filled with alternate layers of iodine pentoxide and glass wool, and was heated in a paraffin bath to 140–160° C. The rate of aspiration was about 1 liter per hour.

The iodine liberated was absorbed in a tube containing mercury, while the carbon dioxide formed was collected in an evacuated flask into which standard barium hydroxide was admitted. The excess of alkali was then titrated with N/20 hydrochloric acid, without transferring the solution. Amounts of carbon monoxide varying from 0.025 per cent to 2.15 per cent were thus determined. When checked against determinations by oxidation with copper oxide, the method showed variations ranging from about 0.001 per cent in case of the smaller amounts to about 0.25 per cent with the larger amounts of carbon monoxide.

Graham and Winmill.—In the same year Graham and Winmill (18) devised an apparatus which is essentially a modification of the Haldane type of gas analysis apparatus. It is designed to measure the contraction which occurs when a mixture containing carbon monoxide is passed over heated iodine pentoxide and the products of the reaction are treated with caustic potash. This contraction in volume is a measure of the quantity of the carbon monoxide present in the original sample.

Three absorption pipettes containing respectively 25 per cent potassium hydroxide solution, bromine in an aqueous solution of potassium bromide, and 45 per cent solution of potassium hydroxide, followed by an iodine pentoxide tube, and, finally, by another ab-

sorption tube containing 45 per cent potassium hydroxide. Graham and Winmill stated that the reaction with iodine pentoxide was rapid and complete at a temperature of 90 to 100° C.

They showed that hydrogen in the absence of carbon monoxide was attacked by iodine pentoxide at temperatures above 135° C., and that when carbon monoxide was present, oxidation of the hydrogen took place at lower temperatures as the percentages of these gases increased. They found that if the mixture contained less than 20 per cent of hydrogen and less than 8 per cent of carbon monoxide, an accuracy of 0.02 per cent could be obtained, while if the concentration of hydrogen was below 1 per cent, amounts of carbon monoxide up to 25 per cent could be satisfactorily estimated. They concluded that for accurate analysis of mixtures rich in hydrogen and carbon monoxide the sample should be diluted with air to bring the concentration of the hydrogen below 20 per cent and that of the carbon monoxide below 8 per cent. Examination of mixtures of carbon monoxide and air containing from 0.02 per cent to over 24 per cent of carbon monoxide gave variations of from 0.01 per cent to 0.03 per cent from the original amounts used.

Froboese.—Froboese in 1915 (6) experimented with mixtures of carbon monoxide and air containing about 0.6 per cent carbon monoxide and about 21 per cent carbon monoxide, and with mixtures of carbon monoxide and hydrogen containing 0.6 per cent and 20.5 per cent carbon monoxide, using temperatures of 70 and 160° C. for heating the iodine pentoxide. The carbon monoxide was determined by titration of the iodine, and also by titrating the excess of barium hydroxide, or by dissolving the barium carbonate in hydrochloric acid, precipitating with sulphuric acid and weighing the barium sulphate. The iodine pentoxide tube was heated to 160° and air passed through for an hour before use. The air sample was passed through a purifying train consisting of a solution of potassium hydroxide, sticks of potassium hydroxide, and concentrated sulphuric acid. With small amounts of carbon monoxide, dry air free from carbon dioxide was passed through for half an hour after a determination in order thoroughly to sweep the apparatus.

Froboese found that hydrogen was oxidized by the iodine being liberated. At 70° C. the reaction with hydrogen was but slight, but at 160° C. large quantities of free iodine were formed. After prolonged use it was found that the iodine pentoxide was colored slightly yellow, due to detained iodine.

More trustworthy results were obtained from the carbon dioxide than from the iodine formed in the reaction. In the case of air mixtures containing about 0.6 per cent carbon monoxide, results were obtained that differed by 0.01 per cent, and in the case of air mixtures containing about 21 per cent carbon monoxide differences of about

0.2 per cent were obtained from the percentages used. Methane alone had no action upon iodine pentoxide at 160°.

Froboese concluded that the iodine reaction gave very nearly correct results with atmospheric air containing a small amount of carbon monoxide (up to 0.5 per cent), provided that air free from carbon monoxide and carbon dioxide was passed over the iodine pentoxide heated at 100° C. for an hour before and after passage of the air under examination, and that the carbon monoxide content of the gas was without influence if the rate of aspiration did not exceed one liter per hour.

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APPENDIX B.

CASE OF WHOLESALE CHRONIC CARBON MONOXIDE POISONING.

The following case of wholesale chronic carbon-monoxide poisoning reported by Morel and Mouriquand[1] is extremely interesting from many points of view. These investigators give the particulars of an instance in which of about 40 persons in one building 35 suffered from chronic carbon monoxide poisoning.

The building in question was large and contained a number of rooms about $6\frac{1}{2}$ meters high. These rooms were occupied for about eight hours a day, and were unoccupied on Sundays and for several months during the summer. Chemical analysis of the air, which was repeated several times, showed that in the majority of the rooms there were abnormal amounts of carbon monoxide which were greater in winter than in summer. The presence of carbon monoxide-hemoglobin was also demonstrated by spectroscopic examination of ox blood, which was exposed to the air of one of the rooms used regularly in winter by several of the people under observation, and by examination of a little human blood furnished by a patient at the time he suffered an attack of headache and vertigo after prolonged stay in this atmosphere. Chemical examination of the air of the room in which this patient had been, as determined by the Lévy and Pecoul iodine pentoxide method, showed the presence of carbon monoxide amounting close to 1 part in 1,000 parts of air, or 1,000 parts of carbon monoxide per million parts of air. Tests made with this method in different rooms showed that in the majority of the rooms abnormal amounts of carbon monoxide were present, ranging from 1 in 10,000 to 1 in 1,000, or from 100 to 1,000 parts of carbon monoxide per million parts of air.

An exhaustive study of the topographical distribution of the carbon monoxide in the different rooms showed that the rooms used by the persons most seriously affected of the 35 under observation were precisely those in which chemical analysis of the air had shown the highest amounts of carbon monoxide to be present in winter. Examination of the air for carbon monoxide in the several rooms occupied by the few people living in this building who did not present

[1] L'intoxication oxycarbonée lente, ses formes frustes. Bull. de l'Acad. de Méd., 1910, No. 41, p. 491.

the symptoms of carbon monoxide poisoning showed the complete, or nearly complete, absence of carbon monoxide. These chemical tests were made during intervals of a period of three years (1908–1910).

An examination of the causes of the presence of carbon monoxide showed that the conditions of this building had been as bad from the point of view of the distribution of illuminating gas during the years previous to the chemical findings just mentioned. The important source of constant leakage of illuminating gas was the diffusion through the joints of the pipes and around the rings of badly fitting gas cocks. Gas-meter measurements showed that the piping throughout the rooms of the building (the rooms had a total cubic content of 7,000 to 8,000 cubic meters) permitted as much as 36 cubic meters of gas to escape into the air of the rooms during a 24-hour period, although every gas cock was closed except that leading to the gas meter. As the illuminating gas supplied to this building contained between 12 to 14 per cent of carbon monoxide, it can be imagined what accumulation of this poison might occur in rooms which were not perfectly ventilated. From the investigation of the conditions of this building it was found that these escapes of gas had been at least as great in the eight preceding years. In addition, defective hot-air heaters which were known to be in use for 10 winters added their quota of carbon monoxide. All of the patients who had lived in this building showed approximately identical symptoms, varying in intensity. Their disturbances generally appeared with all their clinical clearness after the patient had stayed from two to three years in the suspected building, appearing in the early winter and then growing progressively until the spring, and in certain cases until the summer. The beginning was marked by headaches, accompanied sometimes by dizziness. The patients felt sleepy during the day and were overcome by a kind of torpor and inaptitude for work which were inexplicable. They exhibited general weakness, nervous troubles, such as neuralgias and impairment of the memory and digestive disturbances, such as hyperchlorhydria. Twelve of the patients showed intermittent albuminuria; three had temporary albuminuria. Several patients were so affected in their general health that they were considered candidates for tuberculosis institutions. The majority of the patients grew thin and extremely pale. More than half of the patients who had albuminuria had either hereditary or personal albuminuric antecedents. Three patients under 35 years of age who showed alimentary glycosuria at the height of their nervous and hyperchlorhydric troubles were all the sons of diabetic parents. The injurious agent, carbon monoxide, had thus brought out in these cases the hereditary or anterior trait. All these symptoms correspond to the clinical manifestations of chronic carbon mon-

oxide poisoning. The disorders of all the patients appeared while frequenting this building. Symptoms of illness were shown several weeks after returning from their vacations and several days after the heating began. The nervous and digestive troubles followed the same course, appearing in the winter, attaining their maximum in March and April, then gradually diminishing, and finally disappearing during vacations. In the 12 patients showing albuminuria, it always reappeared after a somewhat prolonged stay in the building. It always disappeared when they left it or in the cases in which the patients on suspecting their exposure to gas poisoning worked with open windows. The same thing was true of glycosuria.

Regarding the influence of a stay of some years in this contaminated atmosphere it was shown that while a slightly prolonged stay outside the building during the first years of exposure to the gas poisoning sufficed to remove the troubles, these disorders were shown later on to be more and more resistant to open-air treatment, so that at the end of a stay of from six to eight years, three months in the open air brought about an improvement, but not a complete cure. In certain cases a complete cure was effected only after the patient left the building for from one to two years. The report of Morel and Mouriquand must be regarded as important, as it was shown definitely (1) that abnormal amounts of carbon monoxide existed in the different apartments of the building; (2) that the symptoms of slow poisoning presented by the patients who lived in these apartments were those of chronic carbon monoxide poisoning; (3) that there was a definite relation existing between the appearance and the disappearance of these symptoms and the stay in the building; (4) that chronic poisoning may take place when people inhabit for years places where they breathe concentrations of carbon monoxide ranging from 1 in 10,000 to 1 in 1,000, or from 100 to 1,000 parts of carbon monoxide per million parts of air; (5) that many people do not establish tolerance to amounts of carbon monoxide varying from 1 in 10,000 to 1 in 1,000, or from 100 to 1,000 parts of carbon monoxide per million parts of air, and that they suffer from the ill effects of breathing this poison so long as they inhabit dwellings containing such noxious accumulations of gas; (6) that when persons remained in such contaminated atmospheres for from six to eight years it required months of open-air treatment even to bring about improvement, to say nothing of a cure, this in certain cases being effected only after the patient left the building for from one to two years.

RELATED PUBLICATIONS.

[Literature bearing upon the subject of vocational diseases issued by the Public Health Service, from which copies may be obtained without charge.]

PUBLIC HEALTH BULLETINS:

No. 71. Studies in Vocational Diseases. I. The Health of Garment Workers. By J. W. Schereschewsky. II. The Hygienic Conditions of Illumination in Workshops of the Women's Garment Industry. By J. W. Schereschewsky and D. H. Tuck. August, 1915.

No. 73. Tuberculosis Among Industrial Workers: Report of an Investigation Made in Cincinnati, with Special Reference to Predisposing Causes. By D. E. Robinson and J. G. Wilson. April, 1916.

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PUBLIC HEALTH REPORTS:

Trachoma in Steel Mill Workers. An Investigation of the Origin and Prevalence of the Disease Among the Employees of the Youngstown Sheet & Tube Co., Youngstown, Ohio. By J. W. Schereschewsky. March 6, 1914.

REPRINTS FROM THE PUBLIC HEALTH REPORTS:

No. 195. Industrial Conditions. Their Relations to the Public Health. By B. S. Warren. May 29, 1914.

No. 197. Industrial Insurance. Medical Examination of Employees and Prevention of Sickness its Proper Function. By J. W. Schereschewsky. June 5, 1914.

No. 234. Physical Examination of Workers. By J. W. Schereschewsky. November 20, 1914.

No. 250. Sickness Insurance: Its Relation to Public Health and the Common Welfare. By B. S. Warren. January 8, 1915.

No. 302. Industrial Hygiene. A Plan for Education in the Avoidance of Occupational Diseases and Injuries. By J. W. Schereschewsky. October 1, 1915.

No. 335. Statistics of Disability. A Compilation of Some of the Data Available in the United States. By B. S. Warren and Edgar Sydenstricker. April 21, 1916.

SUPPLEMENT TO THE PUBLIC HEALTH REPORTS:

No. 17. Sanitary Survey of Indiana Industries Employing Woman Labor. By M. J. White. July 17, 1914.

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TREASURY DEPARTMENT
UNITED STATES PUBLIC HEALTH SERVICE

PUBLIC HEALTH BULLETIN NO. 82
NOVEMBER, 1916.

TRANSACTIONS OF THE FOURTEENTH ANNUAL CONFERENCE OF STATE AND TERRITORIAL HEALTH OFFICERS WITH THE UNITED STATES PUBLIC HEALTH SERVICE

HELD AT WASHINGTON, D. C
MAY 13 AND 15, 1916

UNIVERSITY OF

WASHINGTON
GOVERNMENT PRINTING OFFICE
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LETTER CALLING THE CONFERENCE.

TREASURY DEPARTMENT,
BUREAU OF THE PUBLIC HEALTH SERVICE,
Washington, March 9, 1916.

DEAR DOCTOR: I take pleasure in informing you that the fourteenth annual conference of State and Territorial health authorities with the United States Public Health Service will be held at this bureau May 13 and 15, 1916, beginning at 10 a. m., May 13.

It is respectfully urged that your State be represented, as important public-health matters will be brought before the conference for action. Copy of the provisional program will be mailed to you in the near future.

I shall be obliged to you for letting me know as soon as practicable the name of the delegate selected to represent your State.

Respectfully,

RUPERT BLUE,
Surgeon General.

STANDING COMMITTEES.

Morbidity returns:
- Dr. A. J. Chesley, chairman.
- Dr. F. M. Meader.
- Dr. E. R. Kelley.
- Dr. C. Hampson Jones.
- Dr. J. W. Trask, secretary.

Sanitation of public conveyances:
- Dr. Oscar Dowling, chairman.
- Dr. J. N. Hurty.
- Dr. T. B. Beatty.
- Dr. W. F. Cogswell.
- Dr. C. H. Creel, secretary.

Interstate quarantine regulations:
- Dr. J. S. Fulton, chairman.
- Dr. E. G. Williams.
- Dr. H. M. Bracken.
- Dr. S. J. Crumbine.
- Dr. T. B. Beatty.
- Dr. W. C. Rucker, secretary.

Intrastate quarantine regulations:
- Dr. W. C. Woodward, chairman.
- Dr. C. W. Garrison.
- Dr. W. A. Sawyer.
- Dr. E. R. Kelley.
- Dr. W. C. Rucker, secretary.

Health insurance:
- Dr. W. C. Woodward, chairman.
- Dr. B. S. Warren, secretary.

Rural sanitation:
- Dr. W. S. Rankin, chairman.
- Dr. T. D. Tuttle.
- Dr. C. F. Dalton.
- Dr. J. A. Hayne.
- Dr. L. L. Lumsden, secretary.

Standard methods of public-health accounting:
- Dr. A. J. McLaughlin, chairman.
- Dr. C. St. Clair Drake.
- Dr. S. L. Jepson.
- Dr. G. F. Swarts.
- Dr. Carroll Fox, secretary.

Increasing efficiency of conferences:
- Dr. L. R. Williams, chairman.
- Dr. W. C. Woodward.
- Dr. T. D. Tuttle.
- Dr. J. W. Kerr, secretary.

PROVISIONAL PROGRAM.

Opening remarks by the Surgeon General.
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Appointment of committees.
Reports of committees:

Uniform quarantine procedure, Dr. J. S. Fulton, chairman.
Codification of sanitary regulations for intrastate use, Dr. W. C. Woodward, chairman.
Morbidity reports, Dr. E. G. Williams, chairman.
Investigations of pellagra, Dr. J. A. Hayne, chairman.
Sickness insurance, Dr. W. C. Woodward, chairman.

New business:

The use of morbidity reports in State health work.
The model State law for morbidity reports: Consideration of amendments thereto.
The collaborating epidemiologists: Their functions and achievements.
Establishment of an "Area of known disease prevalence." Is it practicable and desirable at the present time? What diseases should be reported and what standard required for admission?
"Sanitation week" observance: Views of the conference as to desirability of designating such special week. Methods for its observance.
Industrial sanitation: Present status of this phase of sanitation in the various States and relation of the State health authorities to it.
School hygiene: Scope of this subject, the extent of legislation so far in force, and the functions of health authorities.
Rural sanitation: Relation of rural sanitation to general sanitation. Extent to which it should be supervised and carried on by constituted health authorities.
Malaria: Development of a uniform plan of campaign sufficiently extensive to embrace widely separated infected areas.
Constitutional diseases: The extent to which they are public-health problems. Official measures that may be inaugurated to reduce the increasing death and sickness rates from these diseases.
Nutritional disorders: Their relation to the public health. What concerted action by health authorities is indicated to eradicate them?
Standard methods of collecting public-health information: Is the adoption of uniform methods of accounting desirable and practicable? If so, what schedules should be used.
Laboratory activities: The last session of the conference (May 15, at 2 p. m.) will be devoted to a survey of the operations of the Hygienic Laboratory of the United States Public Health Service. Demonstrations will be given on this occasion of certain activities of the laboratory, as, for example, the standardization of antitoxins, the preparation of vaccines, methods of waste disposal, etc.

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Fourteenth Annual Conference of the State and Territorial Health Authorities with the Public Health Service.

TRANSACTIONS.

Morning Session, May 13, 1916.

The fourteenth annual conference of the State and Territorial health authorities with the Public Health Service was called to order at 10 o'clock a. m., May 13, 1916, at the building of the Public Health Service, New Jersey Avenue and B Street SE., Washington, D. C.

Surg. Gen. Rupert Blue presided as chairman, and Asst. Surg. Gen. J. W. Kerr acted as secretary.

The following official and other representatives were present:

Arkansas, Dr. C. W. Garrison.
California, Dr. W. A. Sawyer.
Connecticut, Dr. J. T. Black, Dr. J. Frederick Jackson, and Dr. Louis J. Pons.
Delaware, Dr. A. E. Frantz and Dr. William T. Orr.
District of Columbia, Dr. W. C. Woodward.
Georgia, Dr. H. F. Harris.
Hawaii, Dr. D. S. Bowman.
Idaho, J. K. White.
Illinois, Mr. Paul Hansen.
Indiana, Dr. J. N. Hurty, Dr. J. S. Bowyers, and Dr. Charles B. Kern.
Kansas, Dr. Charles H. Lerrigo.
Louisiana, Dr. W. H. Seemann.
Maryland, Dr. John S. Fulton.
Massachusetts, Dr. A. J. McLaughlin and Dr. Eugene R. Kelley.
Michigan, Dr. John L. Burkhart and Dr. A. P. Biddle.
Minnesota, Dr. H. M. Bracken, Dr. A. J. Chesley, and H. A. Whittaker.
Mississippi, Dr. W. S. Leathers.
Montana, Dr. W. F. Cogswell.
New Jersey, Dr. William H. Chew, Dr. R. B. Fitz Randolph, and Dr. Millard Knowlton.
New York, Dr. L. R. Williams and Dr. John A. Smith.

North Carolina, Dr. W. S. Rankin.
Ohio, Mr. J. G. Bowman.
Rhode Island, Dr. G. T. Swarts and Dr. Thomas J. McLaughlin.
South Carolina, Dr. J. A. Hayne.
Vermont, Dr. C. F. Dalton.
Virginia, Dr. E. G. Williams.
Washington, Dr. T. D. Tuttle.
West Virginia, Dr. S. L. Jepson.
Wisconsin, Dr. C. A. Harper and Dr. William F. Whyte.

Representatives of the United States Public Health Service:

Surg. Gen. Rupert Blue.
Asst. Surg. Gens. W. G. Stimpson, J. W. Kerr, W. C. Rucker, and J. W. Trask.
Surgs. H. S. Cumming, T. Clark, L. L. Lumsden, C. Fox, J. Goldberger, G. W. McCoy, B. S. Warren, F. C. Smith, E. A. Sweet.
Passed Asst. Surg. W. F. Draper.
Prof. C. W. Stiles.

Guests:

Dr. T. R. Crowder, director of department of sanitation of the Pullman Co.
S. Juanita McFarland, West Virginia.
Miss Gertrude Seymour, "The Survey," New York City.

Opening Remarks by the Surgeon General.

The Surgeon General. It is my pleasant duty to call to order the fourteenth annual conference of State and Territorial health authorities with the Public Health Service, and to extend on behalf of the Treasury Department and this bureau a cordial welcome to the official State delegates and those whom we have invited to participate in our discussions.

It has been the custom in the past for your chairman to give a brief review of the activities of the service during the preceding year, but on account of the character and scope of our program it does not seem necessary to do so at this meeting. In passing, however, I should like to mention the fact that the revised interstate quarantine regulations, to which much of the time of the last annual conference was given, have been approved and promulgated. I believe that as they stand they represent the most effective measures which the Federal Government has taken to cooperate with State and local boards of health in preventing the interstate spread of disease. I believe the Public Health Service is indebted to those who, at the last annual conference, gave to these regulations such thorough and painstaking consideration.

On account of the undue prevalence of rabies in the Rocky Mountain States and the presence of infection among wild animals, a special conference was called on request of certain western States. This conference was held at Salt Lake City on February 2–3, 1916.[1] Subsequently two medical officers from the service have been sent there to render such assistance as might be practicable.

The program before you is provisional, and I trust that you will feel at liberty to discuss the subjects that have been outlined and to introduce any others that you may consider of sufficient interest and importance to this body.

The secretary will please call the roll by States and Territories.[2]

With your approval, in order to expedite the business of the conference, the chair will appoint a committee on resolutions, consisting of five members. These names will be announced later.[3]

Reports of Committees.

Codification of sanitary regulations for intrastate use.

We will first take up the codification of sanitary regulations for intrastate use, Dr. W. C. Woodward, chairman.

Dr. Woodward. Mr. Chairman, your recorder and myself have prepared a report which I hope the other members of the committee will approve after hearing it read:

The committee which was appointed by the Surgeon General, under date of February 28, 1916, for the purpose of considering the adoption of the interstate quarantine regulations for intrastate purposes, begs to report that after considering the question carefully it is of the opinion:

1. That the adoption of uniform intrastate quarantine regulations as a reinforcement of the interstate quarantine regulations is a necessity; and

2. That on account of the great diversity in the intrastate regulations of the various States a very careful study of the existing regulations will be necessary in order to formulate a model code of intrastate regulations.

In view of these facts your committee recommends that the Surgeon General appoint a committee of three for the purpose of making a careful study of the existing intrastate regulations and to present to the next annual conference of the State and Territorial health authorities with the Surgeon General a model code of intrastate quarantine regulations.

W. C. Woodward, M. D.,
Chairman.
T. D. Tuttle, M. D.,
Charles F. Dalton, M. D.,
Wm. C. Rucker, M. D.

(The report was agreed to by the other members of the committee present and approved by the conference.)

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[1] Transactions of this conference published as Public Health Bulletin No. 80.

[2] The result of this roll call will be found on pp. 11 and 12.

[3] Those appointed were: Drs. W. A. Sawyer, W. C. Rucker, W. S. Rankin (replacing Dr. L. R. Williams, appointed on the committee, but unable to remain for the session of May 15), C. W. Garrison, and T. D. Tuttle.

The SURGEON GENERAL. We will next take up the report of the committee on sickness insurance, of which Dr. W. C. Woodward is also chairman.

Dr. WOODWARD. Mr. Chairman, your committee on sickness insurance, or health insurance—which I think is a better term—begs to submit the following report:

Health insurance, as usually operated under governmental systems, provides that all employed persons in certain occupations, and all persons in other occupations earning less than a specified annual income, be entitled in case of illness to certain benefits.

Benefits.—The benefits ordinarily provided are:

(*a*) Cash payment for a limited period (usually 26 weeks in any 12 months) of a proportion of the wage, or of a fixed sum, to employees, when disabled by sickness or nonindustrial accident (industrial accidents are provided for under workmen's compensation laws).

(*b*) Medical benefits, which include adequate medical and surgical care, medicines, and appliances in home, hospital, sanatorium, or physician's office, to employees disabled on account of sickness or nonindustrial accident during a limited period (26 weeks in any 12 months).

(*c*) Maternity benefits, which include cash payment of a small sum in case of confinements of employees or wives of employees.

(*d*) Cash payment for deaths of insured persons due to sickness or nonindustrial accidents of an amount calculated to cover funeral expenses.

Funds.—The funds are usually provided by payments from employees, employers, and Government appropriations. In Germany the employee pays two-thirds, employer one-third, and the Government pays for certain expenses of supervision. Under the English national insurance act the employee pays four-ninths, the employer three-ninths, and Parliament appropriates two-ninths. In the case of women and persons employed at certain low levels of wages the payments of employer and Parliament are increased and the proportion paid by employee is decreased.

Administration.—The administration, both central and local, is usually according to some form of representative government. In the local government, in addition to governmental bodies created for the purpose, unions, industrial establishments, and certain societies are utilized for purposes of the local administration of the funds.

Extent of health insurance.—In foreign countries voluntary health-insurance systems have been subsidized by the Governments of France, Belgium, Denmark, Sweden, and Switzerland. But more significant as an evidence of the recognition of the efficacy of health insurance is the fact that compulsory systems have been established in Germany, Austria-Hungary, Norway, Great Britain, Servia, Russia, Luxemburg, Roumania, France (for miners, seamen, and railway employees), and Italy (for railway employees).

In this country we are in the first stage in health insurance. No State, municipal, or other government in any way provides for or aids health insurance. There are, however, large numbers of private systems, such as mutual benefit associations and other societies, which provide for health insurance. In addition to these there are various employers' benefit associations, trade-union benefits, and commercial insurance with health-insurance policies.

Bills providing for the establishment of governmental health-insurance systems have been introduced in the Legislatures of Massachusetts, New York,

and New Jersey. In California a State commission has been created for the study of social insurance.

Occupational-disease insurance.—In several States occupational diseases have been included in the workman's compensation acts and the constitutionality of these laws has been upheld by the State supreme courts. This shows a tendency on the part of law makers to apply insurance methods in provisions for sickness. Few diseases, however, are altogether due to the hazard of the occupation; in fact, at times the occupational hazard may be greatly aggravated by other conditions which cause impaired resistance in the worker. Thus the responsibility for many of the so-called occupational diseases is divided, and the classing of them with industrial accidents is not only often impracticable but it tends to load on the employer a responsibiilty which is not altogether his.

The need for health insurance.—The economic cost to every community and to the Nation of preventable diseases and deaths is greatly increased by the unusual prevalence of these diseases and deaths among the unskilled and low-paid industrial workers. All available statistics, both in the United States and in foreign countries, indicate that among those of a low economic status the morbidity and mortality rates are higher than in the rest of the population.

The result of an investigation made for the Federal Commission on Industrial Relations afforded the estimate that each of the 30,000,000 workers in this country loses on the average about nine days each year on account of sickness. Placing the loss in wages at $2 a day and the cost of medical attention at $1 a day, the total loss to the wage earner of the Nation would approximate three-quarters of a billion dollars annually. To this should be added the economic loss resulting from invalidity and death and the loss to industry on account of decreased efficiency due to partial disability. To this should also be added the tremendous sums that are being spent by States, communities, municipalities, and volunteer organizations for the support of charities, free clinics, and hospitals and the like. When all expenditures are taken into consideration the estimate of $750,000,000 seems a conservative estimate indeed.

These cold calculations of cost, however, neither depict real conditions nor do they represent the real attitude of the American public toward such a situation. The generous response of the American public to the necessities of sufferers in the European war is striking evidence of the willingness of the public to deal promptly and efficiently with a situation when once its significance is understood. It needs only to be brought insistently to public attention that in this country the annual loss of health and lives among our industrial workers is not far behind that caused by the greatest war in history. To inform the public of such a situation is clearly within the province of the State health agencies.

Economic factors increase health hazard.—It is not necessary to inform health officials of the character and extent of the conditions which have caused such a situation, but it is doubtful if the underlying economic factors have been adequately analyzed, especially from the standpoint of responsibility for disease-causing conditions. Without going into detailed statements, it may be said that among the more important of these economic factors are occupational hazards, irregularity of employment, unhealthful conditions of living, the employment of women in industry under modern conditions of work, particularly of married women, and the economic disadvantage at which a considerable proportion of wage workers and their families are placed as the result of low wages and insufficient annual income. A number of recent investigations have shown that these factors are important underlying causes of

disease. Any adequate remedial program must fix the responsibility for these conditions in order to arrive at a proper basis for efficient measures.

Responsibility for conditions causing disease.—In a general way it may be said that there are three groups which are responsible for conditions that affect the health of the wage earner—employers, employees, and the community. The employer's responsibility is largely limited to places of employment and conditions of work. The public's responsibility is limited in great measure to community conditions or conditions common to all groups of citizens. To the individual wage earner is largely left the responsibility for the healthfulness of the conditions under which he and his family live, but it should not be overlooked that under present conditions he is often handicapped by the effects of his occupation and of unhealthful community environment. This is a responsibility which a considerable proportion of wage earners are financially unable to meet.

These considerations—the presence of economic factors and the financial inability of so many wage earners to maintain a healthful standard of living—clearly indicate the necessity for a health program which will coordinate the efforts of all responsible groups and of the numerous health agencies at present working too independently in their respective fields.

Advantages of health insurance.—The experience of foreign countries and a study of the situation in this country have shown that such a coordination of effort may be possible in a governmental system of health insurance if properly adapted to National or State governments. By providing for the insurance of all workers adequate relief will be afforded to even the lowest-paid worker.

The joint contribution of employers, employees, and the community to the support of a health-insurance fund will give to each group a financial incentive to lessen the cost by the prevention of disease, since a definite money valuation would be fixed upon each day of sickness.

By providing medical service, with a continuance of a substantial portion of his income during sickness, the wage-earner's family would not be rendered destitute when he stops work on account of sickness and he himself could receive prompt treatment and not be compelled to continue at work until his health is seriously impaired.

Maternity benefits are calculated to conserve the health of the mothers and lower the infant-mortality rate.

The joint provision and control of the fund by employers, employees, and the community will prevent any taint of charity or paternalism, afford a basis on which capital and labor can work together for a common end, and stimulate a spirit of cooperation in the movement for improving the welfare of the wage-working population in every industrial community. Just as the workmen's compensation laws have brought about the nation-wide "Safety first" campaign, so may we expect from the enactment of health-insurance laws a movement for better health that will be intelligent as well as popular.

Relation to medical profession and health agencies.—As stated above, the local administration of health-insurance funds is usually left to local boards created for this purpose, or to trade-unions, industrial establishments, or societies which have been approved by the central governing board or commission. The German act has left the administration of the medical benefits to these local bodies, and this has resulted at times in restricting the insured persons' choice of physicians to a limited number of contract doctors employed by these local agencies and thus caused so much friction as to result in a "doctors' strike." The English act, in the effort to remedy this defect, permitted free choice of physicians registered on the panels of the funds but did not place proper restrictions upon the signing of certificates admitting insured

persons to benefits. The result was that the physicians were entirely too complaisant in signing certificates and the funds were subjected to improper drain.

In the bill for health insurance that has been introduced in the several State legislatures the German plan has been followed and the matter of providing medical benefits has been left in the hands of the local bodies and no provision has been made for correlating the system with existing health agencies. These are serious objections, since without such provisions a health-insurance law will have little value as a preventive measure, although it may meet with the approval of those who advocate it as a relief measure.

There must be a close connection of the administration of any health-insurance system with the health agencies of the country and with the medical profession. It is believed that this can be done in three ways: (1) By providing efficient staffs of medical officers in the Federal and State health departments to carry into effect the regulations issued by the central governing boards or commissions; (2) by providing a fair and sufficient incentive for the active cooperation of the medical profession; and (3) by providing for a close cooperation of the health-insurance system with State, municipal, and local health departments and boards.

Corps of full-time medical officers.—In view of the experience in both Europe and America, it would seem best to place the administration of the medical benefits directly under governmental agencies and to insert a provision that no cash benefits be paid except on the certificate of medical officers of the national and State health departments acting as medical referees under the regulations of the central governing board or commission. Such medical officers should be selected according to civil-service methods. Since these officers are the representatives of the health departments in the funds, their selection and appointment should also be based upon their knowledge of preventive as well as of clinical medicine. After a probationary period of service satisfactory to the health administration they should be given permanent appointments subject to removal only for inefficiency or immoral conduct. One of their duties should be to examine each disabled beneficiary and keep themselves informed as to the progress of his recovery. It is needless to say that the referees should not be permitted to engage in private practice.

Free choice of registered physicians.—With such a check on the payment of cash benefits the medical and surgical treatment provided for beneficiaries could safely be left to the physician of the patient's choice and payment made on a capitation basis, regardless of whether the patient was sick or well, after the manner of the English national insurance act. This method of selection and payment of physicians for the medical and surgical relief would offer every incentive to them to keep their patients well and to endeavor to please by rendering their most efficient service.[1]

Health insurance a measure for prevention of disease.—The greatest value of such a system of administration of the medical benefits would be in the organized corps of medical officers and of attending physicians registered on the panel and in the opportunity it would offer for preventing disease among the insured persons and their families. It would be through the corps of full-time medical officers of the health department acting as referees that the health-insurance system would be linked up with other health agencies. It is not necessary to relate here the advantages which would arise from the visits of such specially trained men into the homes of all sick persons. Nor is it necessary to tell how these officers, acting as health officers, could further lower the sick rate. The objection could not be raised that such a corps would be too

[1] New paragraph inserted here by amendment. See p. 26.

expensive. It would not require more than one such medical officer to every 4,000 insured persons, and at that rate they could more than save their salaries by relieving insurance funds from paying unjust claims. Furthermore, while an estimate can not be made of the amount to be saved by their efforts in the way of lowering the sick rate, it is safe to say that it would amount to many times more than the sum of their salaries.

Health officials should realize now the necessity for correlating the administration of the medical benefits of any proposed health-insurance system with existing health agencies. If health departments are at present inefficient, they should be strengthened and made adequate to meet all demands.

To enact a health-insurance law simply as a relief measure without adequate preventive features would be a serious mistake, but with a comprehensive plan for disease prevention there is every reason to believe that it would prove to be a measure of extraordinary value in improving the health and efficiency of the wage-earning population.

RECOMMENDATIONS.

The following fundamental provisions should be embodied in any health insurance measure proposed for National or State Governments:

1. *Insured persons.*—Every person engaged in a gainful occupation and earning less than a specified annual income, say $1,000, should be entitled to the benefits provided under the law. Every person earning more than the specified annual income should be allowed to qualify for the same benefits or greater benefits according to annual income.

2. *Funds.*—To be provided jointly by contributions from employees and employers; the Government to appropriate for the expenses of supervision and administration.

3. *Benefits.*—The following benefits should be provided:

(*a*) *Cash benefits.*—Weekly cash payments in case of disability due to sickness, nonindustrial accident, or to childbearing by the beneficiary for a period not to exceed 26 weeks in any one 12-month period.

(*b*) *Death benefits.*—Cash payment (for funeral expenses) to legal heirs for death due to sickness or nonindustrial accident.

(*c*) *Medical benefits.*—To include adequate medical and surgical care, medicines and appliances in home, hospital, sanatorium, dispensary, or physician's office, beginning with the first day of disability, whether due to sickness, nonindustrial accident, or to childbearing by the beneficiary or the wife of the beneficiary, and limited to a period of 26 weeks in one 12-month period.

4. *Administration.*—All matters of promulgation of rules and regulations and appeals should be vested in a National or State commission created for this purpose. All matters of local administration should be vested in local boards of directors, federated according to districts, subject to supervision by the central authorities, and rules and regulations promulgated by the commission.

The commission and all local and federated boards should be composed of persons representing the contributors to the funds. The number representing employees and employers should be in the same ratio as their respective contributions.

Provision should be made for free choice of any physician registered on the local panel, and all persons licensed under the laws to practice medicine should be allowed to register on the panels.[1]

[1] This paragraph amended. See p. 26.

A corps of full-time medical officers should be provided within the National or State health service to have supervision of all hospital and dispensary relief; to examine all insured persons claiming to be disabled, and issue certificates in accordance with the regulations promulgated by the commission; to advise the administrative authorities and all contributors to the funds as to the best measures for the relief and prevention of sickness; to advise with the physicians attending sick members as to measures which will shorten the periods of disability; and to perform such other duties as may be fixed by regulations.

Respectfully submitted.

W. C. Wooodward, M. D.,
Chairman.
B. S. Warren, M. D.,
Secretary.

I move the adoption of the report.

(The motion was seconded.)

The Surgeon General. The report of the committee is open for discussion.

Dr. Sawyer. Mr. Chairman, I am very much interested in this report, because in California a social insurance commission is studying the subject with a view to introducing, perhaps at the next session of the legislature, a law providing health insurance.

I agree with the report almost in its entirety; yet there is one vital point with which I most heartily disagree—the attitude toward the free choice of physicians. It seems to me that it is inconsistent for us to argue for full-time health officers and efficient service, when at the same time we are advocating a lowered system of efficiency for health insurance.

The recommendation here is that the insured person should have free choice of any physician registered on the local panel and that all persons licensed under the laws of the State to practice medicine should be allowed to register on the panels. If generally followed, this provision would dash to the ground at once the hope which some of us have in California that through health insurance we shall at last get our medical men classified so that the public to a greater degree can receive the services of the best and will have a method of knowing who the best are. I think it will be admitted by nearly every one here that the laws for licensing physicians in the various States have in part failed, since the standards are still so low that many men are practicing medicine who are not qualified to do so. Such men should never receive the funds which are paid in for health insurance, because they can not earn them. Having failed through direct legislation to raise the standards of the medical profession to a reasonable height, we are hoping that through social insurance, by giving a certain amount of choice to the groups of people who will administer and pay for the insurance, we shall be able at last to classify our medical men and leave out of the panel

those who are not fit to take care of the people under social insurance. So, personally, I advocate at least a partially closed staff.

I wish to advocate also the institutionalizing, so far as practicable, of the whole administration of the care of those insured under such a law. I believe that we should have district centers in which there shall be hospitals, dispensaries, and administrative offices for the care of those within the district. I know from personal experience that much money could be saved through the increased service which selected medical men could give if the patients to a larger extent went to the physician instead of the physician's going to the patients.

The basis for this opinion is the result of an experiment which Dr. George F. Reinhardt carried out at the University of California. For three years I was connected with the students' infirmary which he established. We did not go out more than once or twice a month to the houses of patients, but we received 20,000 visits in a college year in the dispensary and had several hundred bed cases. In return for a small annual insurance fee the students received surgical, medical, and hospital care, and now I learn that the university has furnished dentistry at a low cost under the system. The university public were getting a low insurance rate, and one reason was that they were doing the traveling. If a person was sick we could better afford to pay for an ambulance to bring him to the hospital, so that we could examine him in the dispensary and admit him to the hospital if necessary, than to send a high-grade medical man out to that patient's home.

Of course, in our rural communities there will have to be men attached to the staff to do the traveling, but I believe that our best men should stay in the institutions so far as possible, should have large numbers of patients coming to them, and should have the assistance of a large corps of nurses and other skilled people serving at lower salaries than physicians. In this way the medical expert should be able to multiply enormously the amount of work which he can do and should always be working under conditions which allow a large play of judgment. The large amount of money and time which is spent in traveling and in social conversation with patients under the present competitive system could thus be saved, but would be wasted under the clause to which I object.

Under the plan proposed by the committee we would hire full-time referees to check the more or less competent men who would be chosen by the patients on the basis of personality, the recommendation of neighbors, or any other element which now enters into our basis for choice in the present plan of competitive practice.

The method which I have advocated would permit of specialization far more than would the method of free choice of physicians. I think a patient should come to an institution and should ask for what

he needs. He should be assigned by an administrative officer to the person who can give him what he needs. We should have under one roof groups of offices, including record rooms, medical and surgical consultation rooms, X-ray rooms, laboratories, dental departments, and eye departments. Even if we do not have full-time men for all of these specialties, we could have definite hours which they could devote to the work. In this way I believe we can save much more time and money in shortening periods of disability than if we let any physician treat the sick, and at the same time employ expert men to keep the physicians from being complacent and approving the payment of sick benefits to people who are ill longer than they need be.

There is one more point I wish to bring out. It is not original with me, but I think it is important from the public health viewpoint. It is the relation of health insurance to tuberculosis. If I am not mistaken, the report of the committee makes no special provision in this regard. I believe that we should extend or remove the time limit for benefits in this disease. We should insure in such a way that, if a person comes down with tuberculosis, his benefit will extend as long as he has the disease, because it is one of the biggest risks which the worker faces and he should be protected independent of charity. One of our prominent physicians in California advocated, a short time ago, separate insurance against tuberculosis; but I believe that is undesirable, because the whole matter of insurance should be under one act.

Dr. Bracken. Mr. Chairman, this is an excellent report. I had no idea that there was a possibility for such insurance in this country.

Certain European countries have taken a long step forward in these matters. They have made some mistakes which it should be possible for us to avoid. It is unfortunate that we must do everything through the States; but if some ideal scheme is presented, it is to be hoped that the various States may be persuaded to follow it closely in framing their laws bearing upon this subject.

I presume that in formulating this report the committee has taken into consideration the work of the committee on social insurance of the American Association for Labor Legislation. The recommendations of this committee are very much in line with those presented in this report. As I remember, in the model bill prepared by that committee, it is proposed that the employer shall pay two-fifths, the employee two-fifths, and the Government one-fifth. In the present report the recommendation is that the funds shall be provided jointly by contribution from employees and employers, and that the Government shall appropriate the expense of supervision and administration. I think that is an excellent idea, because those who are contributing their money sometimes object to having it used for

administrative purposes. With this provision their money is used purely for insurance purposes.

Dr. McLaughlin. I have been very much impressed with this report, Mr. Chairman, and am heartily in sympathy with all of its fundamentals. I do not believe that it goes sufficiently beyond fundamentals to have us quarrel over details.

I appreciate very much what Dr. Sawyer said in regard to having incompetent medical officers kept off the panel. There is danger, however, of placing too much restriction on the choice of physicians, such as having the administrators select the specialists who are to treat the insured. There would never be a chance of getting such a bill through in Massachusetts, and probably not in other States. But I think that we can safely leave this matter to the future, permitting the details to be worked out by the local organization which has charge of the district.

In Massachusetts we introduced a bill this year which, unfortunately, gave the impression that it was of the genus "high brow," and was being pushed by a class called professional uplifters. That also means disaster for any bill; and I just want to sound this note of warning, that if we hope to get this legislation through—and I know we all hope to get a health-insurance act through—we must convince the labor unions and the labor authorities that it is their bill. If we go to the general court or to the legislature first and try to get an act passed, or "rammed down the throats" of the labor unions, as they express it, they will fight it, and of course it is impossible to get it through in the face of their opposition.

I think it is quite possible, with a little more education, to get the labor unions and the labor authorities in the States to push actively such a measure as this; and when we do, I feel sure that its success is certain.

Dr. Sweet. Mr. Chairman, I should like to ask Dr. Warren how the work of the health-insurance physicians in England and Germany is correlated with that of the existing health agencies.

Dr. Warren. Mr. Chairman and gentlemen, less than 10 years ago a small group of people got together and started the movement for workmen's compensation laws in the United States. At that time it was not expected that much would be accomplished for years to come. Now 34 States and Territories have workmen's compensation laws which provide for accidents. At the time there was much opposition to this movement on the part of the business interests of the country; now for the most part these same interests are pleased with these laws and they are adjusting themselves to the changed conditions and have organized the "Safety-first" movement which is now nation wide.

This progressive movement has now reached the field of health insurance. To some it may seem rather ideal. Some may call it paternalistic, some socialistic, but it is neither. It is strictly a business method of providing for what is sure to come to every person—sickness and death.

The fact that health insurance is coming may as well be conceded. It is coming before we realize it. It may not come until the economic pressure becomes so acute as to compel action, or it may be that the lawmakers will be farsighted enough to anticipate such a condition and enact the laws at an early date.

With this in mind, health authorities should be prepared with workable plans whereby they can be fitted into health insurance systems to the best advantage to the public and not wait until plans are definitely fixed which will leave out of consideration the public health aspect of the subject.

This brings me to the answer to Dr. Sweet's question. In Germany the law provides that the medical benefits be administered by the "carriers" or federation of carriers. The carriers are the local administrative agencies and, while subject to governmental supervision, are not really governmental bodies. The law provides that the relations between carriers and physicians shall be regulated by written contract and that the carriers, except in urgent cases, may decline to pay other physicians. The law further provides that, if it does not seriously add to the expense of the funds, members shall be given the right to choose from at least two physicians. Under this law, contracts may be made with medical societies, groups of physicians, or with individual physicians. No provision is made for coordination with the health department.

The health insurance funds have, however, realized the necessity for spending money for disease prevention and are now utilizing other health agencies in order to promote the health of their members.

In the English law the only health agencies recognized are found in the chapter which makes provision for the inauguration of comprehensive plans for the care of the tuberculous members. Several counties and county boroughs have adopted these plans and are doing great work in preventing tuberculosis. In no other respect is there any effective provision made for coordinating the health insurance system with the health departments.

Under the plan recommended by your committee, the matter of free choice of physician may be left to the insured persons. I believe, if provision is made for proper hospital and dispensary care, that in the long run insured persons will prefer this method of treatment, so that we may safely count on securing the most scientific medical service at a cost within the means of the lowest paid workers.

This would necessitate a provision for a "panel" composed of all legally qualified physicians who cared to register thereon, and in addition there would have to be provided by contract or otherwise a system of hospital and dispensary units for those who preferred the latter method of treatment.

To leave the matter of medical benefits to the local insurance agencies to be provided for by contract with individual doctors would be a blunder. Such a plan may be expected to obtain, in far too many cases, the doctor who is willing to underbid others in order to secure the contract and afterwards neglect his patients. Furthermore, such doctors are usually poorly qualified for their work. However, it is not necessary to relate here all of the objections to contract or lodge doctors as usually found in the experience of this and foreign countries.

As stated before, the German system provides for medical service by the contract method. This caused so much friction that a "doctors' strike" resulted. The doctors organized into what is known as the "Leipzig League" and raised a fund of several hundred thousand dollars with which to fight this method of medical relief. The strike was partly settled in the early part of 1914 by a compromise known as the Berlin agreement, but it is not permanently settled.

I feel sure that people in the United States would not long submit to this method of treatment, which would too often result in providing a "cheap" doctor willing to underbid to secure the contract.

In England, to avoid this very condition, the British Medical Association among others made the demand that free choice of physicians be provided. This demand was met by providing that medical benefits should be administered by county or county borough governmental committees independent of the local funds or "approved societies." These committees are by the law empowered to provide a panel of physicians consisting of all legally-qualified physicians who wish to register on it. From this panel the insured person has the right to choose.

The result is that over 20,000 out of about 25,000 doctors in England have registered on the panels.

The defect in this system was that the signing of the disability certificate was left to the physician of the insured person's choice. This has resulted in an unfair drain upon the funds, for it must be stated that the doctors have been entirely too complaisant about signing these certificates. To remedy this defect, some committees have appointed medical referees to investigate doubtful cases and to sign the certificates prior to payment of cash benefits. This method has worked out satisfactorily where it has been adopted.

This experience has caused me to advocate the incorporation of this plan into any system proposed for Federal or State law, and I

was glad that Dr. Woodward agreed with me that it would provide a workable plan whereby free choice of physicians could be provided without encouraging malingering.

This plan also provides an excellent opportunity for linking up the health departments with health insurance systems, by the provision that these medical referees be skilled sanitarians detailed from the health departments to issue certificates in accordance with regulations promulgated by the health insurance commissions. These all-time medical men would have to see and keep in touch with all sick insured persons. This would mean the attendance of two medical men (one skilled in preventive medicine, the other skilled in clinical medicine) upon every sick person. It is not necessary to point out the benefits of such a practice, they are too obvious.

Dr. Woodward. Mr. Chairman, the suggestion made by Dr. Sawyer with respect to the removal of the limitation of time in cases of tuberculosis is very alluring. We may fairly ask, however, why we should not remove the time limit with reference to all diseases. It is as reasonable to ask with respect to one as with respect to another, and the mere fact that there are larger numbers of tuberculous patients who may seek benefits does not justify a discrimination in their favor. Personally, if it can be worked out upon a financially sound basis, I should be very glad to see the time limit removed altogether.

One factor which has not been mentioned and which, I think, has to be weighed very seriously in connection with the determination as to how medical benefits are to be given is the effect of legislation of this kind on medical education. Anything that is going to render the practice of medicine a less inviting field than it is now is going to do harm. That again raises the question as to how the treatment can best be provided, whether by the free choice of physicians or by institutionalizing the beneficiaries.

Personally, I think the matter will work itself out under the sickness-insurance acts very much as I think it is probably going to work itself out in private practice. We shall come more and more to institutionalize, if you will, the sick. The time has passed when any one man can claim full ability to diagnose all forms of disease, and we shall have doctors working together in groups in private practice not under the health-insurance acts exactly as we shall have them under the health-insurance acts.

Another matter has been carefully omitted from the discussion, although it goes almost to the heart of the entire matter; that is, whether sickness insurance is to be compulsory or voluntary. I do not know whether we can settle that or not. For the greatest and the most prompt success of any measure of this kind, sickness insurance must be compulsory. The persons who are most in need of a

benefit of this kind are the persons who will be the least likely, in the beginning at any rate, voluntarily to avail themselves of it. They do not foresee their needs, and the taking of even a small amount of money out of the weekly wage is a burden. Furthermore, under a voluntary system, the burden of the overhead charge in the early days will be excessive because of the small number insured and tend to discredit the plan. But it seems to me that we must get sickness insurance, whether it be voluntary or compulsory. We must get it without too much quibbling as to the details. They will have to be worked out later. I believe when we once inaugurate the measure it will grow, exactly as our educational system has grown.

There was a day, of course, not very long ago when public schools were for the poor. Now the Presidents of the United States send their children to our public schools. So, if we provide sickness insurance, we will have it extended wider and wider until sooner or later we shall have in connection with it a system of medical practice that will be similar to our educational system. But that is not going to prevent private practice. We still have private schools notwithstanding our public-school systems. Some of our best schools are private ones. The educator who is seeking an outlet for his intelligence and his energy and his ability can leave the public system if he wants to and can go into private work, and we will have the same situation with respect to the practice of medicine. But we have got to look ahead very carefully to see that we do not frame a system of medical relief which is going to prevent competent men from going into the work because either of the inadequacy of the probable compensation or of restrictions on their opportunities for personal attainment for making the most there is out of themselves and out of their profession.

(The report on health insurance was adopted by the conference. Subsequently the following amendments, offered by Dr. Warren, were accepted by the conference and the amended report adopted:

Amendment to insert after the paragraph "Free choice of registered physicians,"[1] the following paragraph:

"But in addition free choice should be allowed to those who prefer institutional treatment by a selected staff, when available; and to this end the local and federated governing bodies might even provide dispensary and hospital units, each such unit to include a staff of physicians, surgeons, oculists, dentists, and other specialists, and a staff of visiting and bedside nurses."

Amendment to paragraph beginning "Provision should be made for free choice of any physician registered on the local panel"[2] by striking out the words "and all persons licensed under the laws to practice medicine should be allowed to register on the panels" and by inserting "and provision might be made also for adequate institutional care for those who prefer this method of medical benefits.")

[1] See p. 17. [2] See p. 18.

The SURGEON GENERAL. As this is a standing committee no action need be taken in regard to appointments.

Dr. WOODWARD. Mr. Chairman, on behalf of the committee I ought to thank Dr. Warren and say that the report is largely his work. I think there is no one in the country who is better fitted to speak on the subject than is Dr. Warren.

I move that the following resolution from the committee be referred to the committee on resolutions:

The committee recommends that the Federal and several State governments, in order to obtain a basis for intelligent legislation with respect to health insurance, cause careful investigation to be made of industrial health and economic conditions existing within their respective jurisdictions.

The SURGEON GENERAL. If there is no objection, the resolution will be referred to the committee on resolutions.

PELLAGRA.

I should like to ask Dr. J. A. Hayne to give the report of the committee on pellagra.

Dr. HAYNE. Gentlemen, I regret exceedingly that I have no set report to make on the subject of pellagra. I had conferences with one member of the committee, Dr. Goldberger. I have had no opportunity to confer with the other member of the committee, Dr. Galloway, the former State health officer of Mississippi.

I think the committee can agree a little better, possibly, than they did last year. You may remember that then the members of the committee each held diametrically opposed opinions. This year two members of the committee agree—Dr. Goldberger and Dr. Galloway. The chairman of the committee, though, stands among the irreconcilables, who can not accept diet as the sole and only cause of pellagra.

In justice to the other members of the committee I therefore could not, as chairman, make a report for that committee. I had hoped that Dr. Goldberger would be here and would be able to make a majority report for the committee. As you all know, there has been a great deal of good work done this year on the study of pellagra, especially the work done by the United States Public Health Service.

Dr. Goldberger asked me the other day how far I could go with him, and I told him that I could go as far as believing that if a person who has pellagra is given a proper, well-balanced diet, with hygienic surroundings, he will get well; that if a whole community is kept in that condition, well fed, properly housed, and given sanitary surroundings, they will not develop pellagra; but when it came down to saying that I believed that the sole and only cause of pellagra was some vital element, or whatever you may choose to call it, either lacking or present in the food, that it was due to excess of

proteids or lack of proteids or any of those propositions, I could not accept it.

Conclusions published in the Journal of Infectious Diseases for May, 1916, covering a national study of the disease, give my present idea in regard to it. They read as follows:

More than 78 per cent of the patients had associated with other patients before they developed the disease. Thus 33 per cent of the pellagrins developed the disease in houses which contained other cases, while in most of the remaining instances there were patients in the adjoining houses or within the same block with whom they came constantly in contact.

The water used was derived from various sources; it can, therefore, hardly be considered an important factor in the development of the disease.

White and colored races appear to be equally susceptible. More white people than colored people develop the disease in the spring. The reverse holds true for the summer months. The mortality appears to be greater in the negro race. Relatively few cases were found among negro children. Individuals from 10 to 20 years of age are less susceptible than at any other period of life. Women 30 to 50 years of age are from three to four times more susceptible than men. Over 50 years and under 10 years both sexes are equally susceptible. In the rural district surveyed more men than women were affected.

The diet contains an excess of carbohydrates, but 68.8 per cent of the patients gave histories indicating that they were consuming proteins in considerable excess of 40 grams a day, an amount which has been shown to be sufficient to sustain life without the development of pellagra.

There are also some studies in regard to the finding of the bacillus Welchii in stools of pellagrins by William H. Holmes, of Chicago, which also seem to point somewhat to the infectiousness of the disease.

In our own State, of which I am able to give the statistics, we found some exceedingly great surprises this year, both in the distribution of the disease and in the fact that our preconceived notions in regard to it were proved to be erroneous. For instance, we were led to believe that the disease occurred principally in mill villages in the upper or mountainous portion of the State. We were led to believe that it did not occur in the cities but was more a disease of the rural communities. As a matter of fact, Charleston, S. C., which is the largest city we have in the State, had 185 deaths from pellagra, which gave it a rate of 208 per 100,000 of population. Charleston, as you probably know, is a very closely built town. It has more people per acre than any other city in the South unless it be New Orleans, and the poor and rich live close to each other on account of the arrangement of the city. The next county to Charleston was Sumter, which is just midway between Charleston and Greenville, and the next one was Greenville. County rates were from 208 per 100,000 down to 32 per 100,000.

There were 1,475 death certificates signed by physicians for the year 1915 in South Carolina, which is a very large number. Tuberculosis has a death rate of 123.8 per 100,000, and pellagra one of 91.3 per 100,000. The only other diseases that come between are dis-

eases of the kidneys and diseases of circulation; so that of the definite diseases pellagra stands second to tuberculosis in the State.

We have endeavored to take advantage of the work done by the Public Health Service in regard to the prevention and treatment of the disease, and we are now doing community work in various parts of the State, emphasizing the necessity of sanitary surroundings and proper food. We tell them that if they will keep a cow, eat eggs and a proper amount of meat, have a sanitary privy and good water supply, the probabilities are that they will escape pellagra and tuberculosis and typhoid fever.

Dr. KERR. Mr. Chairman, it may be remembered that last year this committee was appointed by reason of some little disagreement. It seems hardly necessary for me to mention the different points of disagreement.

Though I have not engaged in them myself, I have been in very close touch with the pellagra studies, and I hoped that the committee would be able to combine on an earnest recommendation to the members of the conference who come from States where pellagra prevails in considerable numbers—and, indeed, from all States, because it appears in all States—to accept provisionally the statement that pellagra is due to an unbalanced diet, at least to the extent of advising physicians and those who suffer from the disease to try a balanced diet. It certainly is not an unpleasant prescription, and I feel that sickness and deaths will be reduced by that means. We can then wait for what future investigations will bring forth.

Last fall, in a small mining community in one of the southern counties, I met a physician who had about 40 cases of pellagra during the summer. They had all been cured. His method was simply to feed them.

I think that the best result we could hope for would be to give the dietary hypothesis a thorough trial. The Public Health Service is doing that now, I think. We have three orphanages where are housed approximately 700 children. We have 145 insane persons in a similar experiment; also 38 persons who were working in the mills have come to us because they had pellagra, and they have eaten one square meal a day and have recovered; this without interruption of their employment. We hope to continue this experiment, as well as other more technical experiments.

Dr. GARRISON. Mr. Chairman, I like the suggestion just made. The physicians over the South are still at variance with reference to the etiology of this disease. At the meeting of the Southern Medical Association last fall Dr. Freeman very ably represented Dr. Goldberger in his absence with a paper on pellagra; but after having read it he had to leave, and when the discussion was opened it seemed to me that 95 per cent of the physicians present were imbued with the idea that pellagra was due to an infection. They

began to criticize and condemn most severely the Public Health Service and health authorities for publishing in the newspapers the statement that it was of dietary origin, putting forth a good many arguments against such a statement. Among other things, they brought out the fact that for a long time we had taught that malaria was due to bad air, and after we discovered that it was infectious we had to disabuse the minds of the people of the idea that it was not infectious before teaching them that it was transmitted by the mosquito.

It seemed that there was no one there to take the part of the Public Health Service or health authorities, so in defense I took this position: That no one had offered anything in the way of treatment that was worth while except a proper dietary or properly balanced diet; that no one had offered anything as a prophylactic measure that was worth while except a properly balanced diet; that in Arkansas we had been carrying on a campaign for diversification of crops and intensification of farming and had been using the theory that pellagra was caused by an unbalanced diet to secure a diversity of crops. In so doing I felt that, if we could teach the farmer to have his own cow, his own milk, and his own butter, raise his own vegetables, have his own meat, and live at home, the results accomplished would be worth while. I felt that the dietary treatment of pellagra should receive indorsement from the doctors from that point of view.

I should like now to see this body go on record as indorsing such a movement, because we have a good deal of opposition. I find that the physicians in Arkansas who try out this method almost invariably say that it is the only method that offers anything, and I think a great many of them are in favor of the dietary idea at present. But certainly at the meeting of the Southern Medical Association in that particular section there were some several hundred men 95 per cent of whom must have been opposed to the dietary theory.

Dr. Rucker. Mr. Chairman, it is a remarkable thing how history repeats itself, particularly in medicine. Many of you may recall that a great many years ago there was much argument as regards the infectiousness of cholera. The medical profession at that time divided itself into three schools. We had first of all those who were in the minority, who believed in the infectiousness of cholera. Then we had another school, which was in the majority, that believed in the noninfectiousness of cholera. Then we had a school that chose a middle course, the contingent contagionists. They believed that cholera might, under certain circumstances of terrestrial magnetism and other unknown factors, assume a contagious character. But the work of Snow and Budd and others proved that, though the disease

might possibly be conceived as being noncontagious, or contingent contagious, or even contagious, if you kept the discharges of the sick from the mouths of the well you stopped the incidence of cholera. And so, on that basis, cholera was controlled.

Now, it seems to me that in the case of pellagra we have a somewhat similar circumstance to that related by Manson with regard to hookworm disease in Trinidad. In his lectures which he delivered at the Cooper Medical College, in San Francisco, he said that at that time there was an Englishman living in Trinidad who employed a large number of coolies, among whom there was much tropical anemia. This man, like a great many other people, believed that it was something which rose from the earth which had to do with the disease, and he observed that those men who wore shoes did not get hookworm disease. So in his travels he hit upon a scheme. When in search of health he went over to the Schwarzwald, in Germany, and there he observed the way they prepared geese for the market. He found that before the farmer took his geese to market he provided each goose with a neatly fitting antiseptic sock which would resist the road. The way he did it was to drive the geese through a trough full of tar and out on the sand. Then the geese were shod and ready for the road. This man resolved that he would try it with regard to his coolies, so each morning he made them step into a bucket of tar and out on the sand, and he immediately stopped tropical anemia among his coolies.

Now, we know, though we may quibble about the finer points of contagiousness or noncontagiousness or contingent contagiousness of pellagra, that if we feed pellagrins they get well, and that if we feed well people properly they do not get pellagra. And so it seems to me that we should agree upon this point, at least, and carry it forward in our propaganda, remembering all the time that when health officials disagree people die.

MORBIDITY REPORTS.

The Surgeon General. We will next take up the subject of morbidity reports. Dr. E. G. Williams is chairman of the committee.

Dr. E. G. Williams. Mr. Chairman, I think that all the members have copies of the report, which I am indebted to Dr. Trask for fixing up for the committee. These matters are presented for the consideration of the conference:

I.

COLLABORATING EPIDEMIOLOGISTS.

Which plan is to be preferred:

(*a*) To appoint collaborating epidemiologists, at $300 per annum, as at present, in those States where sufficient cooperation and sufficiently accurate in-

formation of the prevalence of disease can be obtained to warrant this procedure.

(*b*) To appoint collaborating epidemiologists, at a strictly nominal sum, such as $5 per month, in all the States, and also, perhaps, in the larger cities.

(*c*) To establish an area of "known disease prevalence," in which satisfactory morbidity reports are obtained currently and forwarded to the bureau, and to appoint collaborating epidemiologists only in the territory included in this area.

II.

MODEL LAW FOR MORBIDITY REPORTS—CHANGES SUGGESTED.

Add the following to the list of notifiable diseases: Erysipelas; influenza; all cases of poisoning, both accidental and intentional.

III.

STATE ANNUAL REPORTS OF PREVALENCE OF DISEASE.

(*a*) Can reports of notifiable diseases for the preceding calendar year be furnished by February 1? If not, why not?

(*b*) Can reports of deaths from notifiable diseases for the preceding calendar year be furnished by March 1? If not, why not?

The annual reports of the notifiable diseases for the calendar year 1915 were received from the several States on the dates shown below:

States.	Cases and deaths.	Cases only.
Connecticut	Feb. 18	
Indiana	Before Feb. 18	
Kansas	do	
Louisiana		Before Feb. 18.
Michigan	Before Feb. 18	
Nevada		Do.
Oklahoma		Do.
Texas	Before Feb. 18	
Virginia		Do.
Wisconsin	Before Feb. 18	
Wyoming	do	
Hawaii	Feb. 28	
Mississippi		Feb. 28.
West Virginia	Mar. 9	
Washington	Mar. 15	
Ohio	Mar. 18	
Oregon	Mar. 29	
Vermont	do	
New York		Mar. 30.
District of Columbia	Mar. 31	
Minnesota	Apr. 4	
New Jersey	Apr. 27 (deaths)	Apr. 4.
Maryland		Apr. 13.
Porto Rico	Apr. 14	
California	Apr. 15	
Arizona (deaths only)	Apr. 17	
Alabama	Apr. 19	
Utah	Apr. 25	
South Dakota	May 11	

(*c*) Would it be better to publish the reported prevalence of notifiable diseases as soon as the cases are available and later, perhaps when the number of deaths are available, publish a second table showing fatality rates?

(*d*) Dr. Charles V. Chapin suggests that in the annual reports of prevalence of disease published in the Public Health Reports mortality rates for the notifiable diseases be added to the tables. These rates have not previously been given.

Dr. Chapin's argument in favor of this is that the Census Bureau does not publish these rates until about a year later. The census rates, however, would differ from those computed from the figures furnished by the registrars.

The Surgeon General. I will call on Dr. Kelley to open the discussion of this report.

Dr. Kelley. Mr. Chairman, one of the most serious problems which we have to settle in taking up the question of morbidity reports is the advisability of extending the list of notifiable diseases. There are three fundamental principles, I believe, that should be considered as justification for requiring reports of diseases.

First, certain reports (*a*) for use, you might say, in an emergency, or (*b*) for use in an attempt to keep out a disease which is extremely rare and which there is every likelihood of being able to control if it is promptly detected. Everybody will admit that in a disease of type (*a*)—take typhoid as a typical example—a disease against which we can do emergency work promptly, the report is entirely necessary. For the other type (*b*) you might cite Asiatic cholera, an exotic disease, where notification of the first case would be all important.

The second fundamental group is one in which the work of the health authorities represents a long drawn out struggle, with the end not yet clear, the means not yet clear, as in tuberculosis.

The third principle would be in collecting certain data for individual diseases which we are not using at all at the present time and do not know exactly how to use in the future, but concerning which we believe it would be a good thing to have some information available. It is a very easy thing to go on from that and in the light of such subjects as health insurance, to argue the advisability of general morbidity reports—reports in all cases of sickness, which would be the ultimate, final desideratum.

But, taking it from the standpoint of practical use of the reports, I must confess to considerable change of heart as to the advisability of adding to this list of notifiable diseases. I have been responsible in the past for the appearance on that list in the model law of some of the rather infrequent diseases, and I am sorry for it.

Less than six months before my arrival in Massachusetts the State added to the list of notifiable diseases. For practical purposes I believe we would be better off if this had not been done. It is important to remember that as yet the average physician considers it a

good deal of a bore and a nuisance to report diseases, and the more detail he has to cover the less he likes it. It is, therefore, very essential that our list be so constructed that there can be very little debate as to its usefulness and as to the practical purposes it is going to serve.

For instance, mumps was added quite recently in Massachusetts. Practically I do not see where we are better off for that addition. We have added septic sore throat. I do not know who thought of that first, but I would not like to tell you what I think of him. If there is anything that is an anomaly, it is the term "septic sore throat." What does it mean? It does not mean anything. On a pathological basis any infection of the throat or fauces can be called septic sore throat. On a bacteriological basis we can say that the existence of a septic microorganism in the throat causes a septic sore throat. Any case of tonsillitis would be septic sore throat. In Massachusetts we found that an overconscientious physician would be likely to report almost anything, and a good deal of the health authorities' time was wasted in looking up these cases to see if there was an epidemic. Finally we arrived at a practical solution: We had the physicians report septic sore throat only when it was occurring in an epidemic form.

We have also included among our diseases dog bite requiring antirabic treatment. Dysentery and German measles are two other diseases on the list which we would be better off without.

Influenza is suggested in this report. I think we might as well have the disease acidosis alongside it. Put them both on the list and then see what kind of a report you get. No one agrees as to what influenza is, and I think that morbidity reports concerning it will be worth nothing. Furthermore, I can hardly see the advantage in reporting a case of erysipelas. The other class, the class of poisonings, is very different; but I think we ought to go pretty slow on this question of adding indefinitely to the list of notifiable diseases until we get to the point where we can reasonably ask the physicians to report all kinds of sickness.

The scheme of having two sets of lists, the common and the rare, and putting the rare to one side of the report, is open to the same objection of having too protracted a list for the physicians to remember.

The next point is as to the annual reports of prevalence of disease:

Can reports of notifiable diseases for the preceding calendar year be furnished by February 1? If not, why not?

That depends entirely upon the character of the regulations under which the different States work. In some States there is no reason why they can not be furnished by January 5, except, possibly, a little difficulty in getting the clerical end of it through by that time.

Can reports of deaths from notifiable diseases for the preceding calendar year be furnished by March 1? If not, why not?

That is very easy to answer. In some cases they can be; in other cases they can not. It depends upon the character of your vital-statistics law. In some States complete reports can not be sent in by that time, because there will be some late returns and some deaths where the diagnosis is doubtful; but the great bulk of the deaths could be reported by March 1. In Massachusetts, unfortunately, it is impossible to do that, because the largest city in the State has the privilege of not being compelled to file its complete death returns with the State bureau of vital statistics until May or June.

From most of the States in the registration area it would seem as if there should be no difficulty in getting approximately complete reports by March 1.

Would it be better to publish the reported prevalence of notifiable diseases as soon as the cases are available and later, perhaps, when the number of deaths are available, publish a second table showing fatality rates?

I believe it would—unless we can get fatality rates in much faster than at present.

The objection raised to Dr. Chapin's suggestion that the mortality rates be added to the annual reports of the prevalence of disease—that the census rates would differ from the figures furnished by the registrars—probably holds good to some extent. However, the returns from which the Census Bureau officials make their calculations are the transcripts of death certificates which are furnished them by the same State's authorities, and the discrepancy will be due to whether in one instance the State authority takes a contributory cause when the Census Bureau takes the final cause, and vice versa. That will sometimes make a difference of as much as 2 or 3 per cent. But, in general, I think it will be accurate enough if it is remembered that all statistics are approximate anyway. When it is considered that they are based upon an estimate of population which probably represents a percentage of error considerably greater than that involved by the discrepancy of classification, I think that there should be a degree of usefulness in getting that comparison between the average returns of morbidity and mortality sufficiently great to justify publishing them in the Public Health Reports. To be sure, so far as the death rates go, we would get them from the Census Bureau, but from a year and a half to two years and a half later, inasmuch as the 1914 statistics are not yet available. Therefore, unless there is a very distinct improvement in the speed with which the mortality tables are put out by the Census Bureau, there will be a great practical advantage in getting at least a rough, crude approximation of the mortality rates from communicable diseases published in the Public Health Reports.

Dr. SWARTS. Mr. Chairman, I agree with the previous speaker in that if we expect to obtain any success from these reports of morbidity cases they have got to be made practical. If you give a physician a list of 15 or 20 diseases, he forgets which of these to report, becomes discouraged, and fails to report even the most important ones. You ask him to report erysipelas, and he will ask, "What is the practicability of that? Why not report every infected wound as well, every case of suppuration?" It is the epidemic diseases which are of interest to the health department. During the prevalence of diseases of the respiratory organs last December, January, and February everything was reported as influenza, and yet the influenza bacillus was found in only perhaps 3 or 4 per cent of the cases.

A physician can not be coerced. He has got to be coaxed. If, as in Rhode Island, he refuses to report his birth returns, for which he receives 25 cents each, do you expect him to report influenza and erysipelas when he is going to receive nothing for it and you are going to take no action on his report? He considers that the health department is just curious about figures and statistics.

Furthermore, if you are going to include everything in the list that you would like to have, and that you ought to have, you will not only have the opposition of the profession but that of the laity. During the last session of the legislature I endeavored to secure a provision whereby all physicians should be obliged to report such diseases as the State board of health should designate. Opposition came up in the senate. There were two of the leading members of the senate who did not propose to have the board of health designate the diseases that should be reported, because there were two diseases which the board might at any time place upon the list which they did not like to have reported. They were private and individual diseases which belonged to the individual families, and these senators did not care to have them made public; and inasmuch as they were to be reported by post cards and by telephone they feared that there might be a leak, and some one might discover what was taking place. Consequently I was obliged to designate what diseases should be reported under the law instead of keeping the desirable flexibility. Fortunately I got ophthalmia neonatorum in the list, since they did not recognize it as a gonorrheal infection.

Dr. TUTTLE. Mr. Chairman, in Washington we have the flexible law that Dr. Swarts has referred to.[1] We can put anything we want on the list. I can not remember the names of the diseases that must be

[1] This law reads (Remington and Ballinger's Code): "Section 5547. The term 'dangerous, contagious, or infectious disease,' as used in this act, shall be construed and understood to mean such disease or diseases as the State board of health shall designate as contagious or infectious and dangerous to the public health." (Approved Mar. 12, 1903.)

reported in our State myself, and I do not think there is one doctor out of a hundred in the State who can tell you.

I received a letter a short time ago from the health officer at Spokane, who said:

We are willing to do everything within human power, but the city commission has refused to give me an additional clerk. Therefore I can not furnish you daily the copy of the epidemiological card relative to measles, as we are having about 500 a day. It is an impossibility to get the report made up daily. However, we will get it up as fast as we can.

Now, suppose we add influenza to the list. In January we had influenza all over the State. The health officer would have been swamped with reports of influenza. Moreover, one doctor will report getting cases and another will report none—both equally busy. We will get after the one who has reported none and ask him, "Haven't you had any influenza?" He will say, "Not a case; we have had an awful lot of grip, though."

Then this "septic sore throat." I think the term was devised by somebody for the purpose of ducking the diagnosis of scarlet fever. That is about all the use that is made of it.

We could send the Public Health Service a report on the 15th of January as far as morbidity is concerned, but our deaths we can not send until March.

As to the question of making an estimate of death rates, what are you going to base your estimate on? The Census Bureau's estimate of the population? Nearly 58 per cent underestimated in Washington in 1908, according to their own figures. To-day they are probably as badly underestimated in Montana as they are overestimated in Washington. The result is that Washington has an absurdly low death rate and Montana an absurdly high one. If we are going to estimate the death rate, let us base it on facts.

Dr. Bracken. Mr. Chairman, I can see only one reason why reports of notifiable diseases for the preceding calendar year can not be furnished by February 1. Sometimes it may be hard to keep up with the regular routine work, in the wintertime especially, and to get such reports out promptly enough.

Can reports of deaths from notifiable diseases for the preceding calendar year be furnished by March 1?

They certainly should be in all of the registration States, because a death certificate is given only on the issuance of a burial permit, hence the death certificates should all be in the hands of the State registrar by the 1st of February at the latest.

The recommendation of Dr. Chapin, that the Public Health Service should give us reports of deaths, is a good one.

Dr. Frantz. Mr. Chairman, Delaware, of course, is a small State, but it can be taken as one of the units in larger States. We have

three counties, with a population of about 210,000. We require the undertaker, within 24 hours after he receives his death certificate from the physician, to make a postal-card report of the death to the bureau of vital statistics. These go into a filing cabinet weekly, so that at the end of every week we can tell just the number of deaths from every disease. Then there are monthly and quarterly files.

In Delaware we have a different system of registration; that is, the death certificate does not come to the bureau of vital statistics until the end of the quarter. The local registrar in each district (there are nine local registrars) is required quarterly to make three copies of his death certificate—one copy for his own office, one copy for the recorder of the deeds of the county in which he is registrar, and one copy for the bureau of vital statistics. At the end of the quarter we check up the postal-card report from the undertaker with the death certificate. At first we had a little trouble with the undertakers; but to-day we are getting 100 per cent of the deaths of Delaware. They are all recorded systematically and an index is made out yearly for the bureau of vital statistics and for the recorder of deeds.

We require morbidity reports, as is usual in the other States, within 24 hours, and there is a fine from $5 to $25, as in other States, for nonreporting. These reports are filed away in filing cases, so that we can tell weekly, monthly, and quarterly just how many cases of diseases have been reported.

Are we getting full morbidity reports now? We have had this plan in operation for a year. The reports are improving each month and each quarter. Rome was not built in a day, and you can not expect to take up a proposition of this kind and right off the bat have your physicians make complete and perfect reports. I do not believe we will ever get complete morbidity reports—not as complete as death reports—but there is no reason why we should not in time educate physicians to make fairly complete reports.

There are methods of telling whether physicians are reporting. For instance, your death report comes in and you have no morbidity report for the case. You can go after the doctor and give him warning. A record is kept of these people, and if one keeps on neglecting his report, he is fined. It does not take many fines to make him report. There is no physician so active or busy that he can not sit down in the evening and make out his postal-card report.

The importance of the 24-hour morbidity report is greater than that of the death report. Why? We have up in Wilmington certain watercourses. If there is typhoid fever, the moment a case comes up we refer it to the water department and they send their men out to the watershed and see that proper care is taken of the offal.

I would not advise adding to the list of diseases at the present time.

Dr. Hayne. Mr. Chairman, I would like to say that we do the best we can in South Carolina toward getting morbidity statistics. We are honest about it; we don't get them. We probably get as many as the surrounding States get.

As to the reporting of deaths, we are not admitted to the registration area. Why, I can not say. According to the census report, made by men whom they sent down there, we get 93.7 per cent of the number of deaths that occur in the State. They said to us that they required 90 per cent. They admitted Virginia, without any investigation whatsoever, with a showing of 14.2 per thousand of population. Our showing is 15.1 per thousand of population, and, according to the Census Bureau, our population figures are accurate. They admitted North Carolina on 9.4 per thousand of population.

We can not only give the deaths but we can give them within the dates set here. We can give them before the 18th of February for the preceding year. And I agree with some of the others that those deaths should be put along with the morbidity report, because I think that it will show some very astonishing death rates.

For instance, in some reports we have more deaths than we have cases. This occurs infrequently, but still has occurred. It occurred in pellagra, where we had twice as many deaths reported as cases. And as to these other diseases, I agree with the other speakers that we should limit the number of notifiable diseases to those that the State department of health or the local board of health is going to do something about. I do not think there is any necessity for a doctor to report a disease simply for statistical purposes. A doctor does not receive any pay for it, and he has a great many things to do for which he receives no pay. He has to make out death certificates; he has to make out birth certificates; and I think he is worked hard enough without being required to report a lot of diseases about which the State department of health is going to do nothing.

Dr. Trask. Mr. Chairman, I think that everybody who has talked on this point of the notifiable diseases has stated facts which are irrefutable and with which we all agree. I do not believe that any disease should be notifiable unless the health department intends to attempt to control it; but when it does, then the disease must be made notifiable. I can not conceive of any effective way of controlling a disease without the information that comes in this manner to the health department.

The suggestion that certain diseases be added to the list in the model law, however, referred to the model law that the conference has adopted. As regards this law, it is not expected that each State will make the diseases mentioned therein notifiable at this time, because it is well known that there are many States in which they

would not be reported. There are some States that have not the necessary machinery for properly handling these reports and using them, even if the physicians did report the cases; there are many States in which the physicians are not yet educated to the great importance of these reports; there are also many States where notification of none of the diseases is enforced, and the physicians seldom do it of their own accord.

This model law represents the consensus of opinion of this conference as to what is desirable under an efficient, adequate health department, backed by an intelligent community. This represents the model, as its name implies. The question of whether these diseases should be added really means: Does the conference consider that these diseases are preventable and that the control of their occurrence should properly be attempted by the health department; does the conference believe that, if the health department could do all the things it ought to do and would like to do, the occurrence of these diseases should be prevented by it? If so, the health department would need the information furnished by reports of cases.

Dr. Frantz. Mr. Chairman, I should like to say just a word in the line of Dr. Trask's thought. The immediate morbidity report gives the health department the opportunity, where they have any literature, as, for instance, in cerebrospinal meningitis, in diphtheria, in scarlet fever, in typhoid fever, and, we will say, whooping cough, to send out at once to the patient and family such literature on the subject as they may have for distribution; and I think that is one of the important matters that immediate morbidity reports will attain for the preventive medicine of the future.

Dr. L. R. Williams. Mr. Chairman, I would like to express my appreciation to the Surgeon General's office for preparing the excellent programs for these conferences. It seems to me that since I have had the pleasure of attending these conferences you have added to our discussions here a number of topics which are quite above the opportunity of the different State departments to avail themselves of at present, and I think that it is quite proper and fitting that you should do so. You have brought up this morning the question of health insurance, which may be a matter of 10 years in the future. You are bringing up the question now of morbidity reports which are not going to be adopted at once and can not be carried out in detail for some time to come. But I do not see any reason why we should criticise the suggestion of adding certain diseases to our morbidity report just because they can not be made use of at present. There are some diseases, for example, one that Dr. Kelley and other gentlemen have spoken of, German measles, a trivial disease, and yet by means of having German measles reported in New York

State we have been able promptly to control three epidemics of scarlet fever. So it is rather useful to have those diseases reported.

Another disease which is very laxly reported is chicken pox. We have required every adult with chicken pox to be visited by a State inspector and a definite diagnosis to be made as to whether it is chicken pox or smallpox. As a matter of fact, what we ought to do in morbidity reports of communicable diseases is to require only those reports where we can expect the local health officers or the State men to see that something is done to prevent the further spread of disease.

Those of you who were at the meeting of the Congress of American Physicians and Surgeons last Tuesday afternoon may have heard Dr. Hugh Cabot, of Boston, read a paper on "Syphilis and Society," in which he deprecated the reporting or attempting to report cases of syphilis, for the sole reason that the reporting of a case of syphilis to the sanitary authorities did not do the patient any good; and that remark was given very loud and prolonged applause, which, I think, shows rather well the attitude of physicians—they are thinking of their patient and of themselves and not of the prevention of disease among the rest of the community.

There is one very important thing, it seems to me, in regard to this whole subject of morbidity, and that is that we should study our reports and find out where we stand on morbidity. In New York we have been trying for the last year to find out just how many cases dying of certain communicable diseases had been reported to us during life, and we found that during 1915 of those dying from tuberculosis about 50 per cent were reported during life, and that since the 1st of January about 65 per cent were so reported. We find that the same is rather true of typhoid fever. Of the cases dying of typhoid fever about 75 per cent have been reported during life.

Then we made another study of the fatality rates of the different diseases and it was interesting, especially in the minor diseases, to find that in whooping cough and measles the fatality rate was anywhere from 150 to 300 per cent in different communities, showing that cases were reported at death and usually not otherwise. We were quite surprised to find that in two counties of the State the fatality rate from typhoid was over 100 per cent; that is, practically the only cases reported were the ones reported just as they were about to die. In diphtheria and scarlet fever, on the other hand, it is quite different. We find in diphtheria about 98 per cent of the cases that die are reported during life, and in scarlet fever we find that practically all are reported during life.

We have wanted to go further on that whole subject. For the past year and a half we have tried to send to physicians a statement whenever the rates of morbidity were high in the county, telling them

what the law was and also to send a circular letter to every one in that community. We have endeavored to stimulate in every way we could an interest in having these diseases reported. Since the 1st of January of this year we have had some one of our men from the central office visit almost every county medical society at their meetings and give a talk on the importance of reporting communicable diseases. We have begun to send out official bulletins to every physician in the State (and it is quite an order to do so; there are about 7,800) notifying them about the importance of reporting communicable diseases. We are now sending a special letter on the same subject. We are hoping that the public health committee of the State Medical Society will report a resolution in favor of physicians' reporting cases of communicable diseases that are required by the authorities.

Then we plan, beginning on the 1st of July, actually to begin to prosecute physicians who have failed to report cases of communicable diseases. By law physicians are paid 25 cents apiece for reporting, but I do not believe one physician in a thousand ever takes the trouble to collect that. At least we have never heard of anyone who does it. The health officer, who gets his pay indirectly, in part, that way, takes care that he gets his fees.

It seems to me that what we really want to know is, How much do these morbidity returns mean, and how far can we go in following up the different cases of disease?

It would seem to me that we could rearrange a good many of our tables in regard to communicable diseases. I have been very much surprised at the meagerness of detail in regard to various communicable diseases. For example, I read in the press sometime ago an article which stated that deaths from diphtheria had been steadily increasing and that there was more diphtheria in Massachusetts than there ever had been. That statement was ignorantly made, because there was no consideration given to the question of increase in population in Massachusetts. Apparently the individual who wrote this letter to the paper had found the Massachusetts figures which give the cases and deaths for some years past. The only other State that gives these figures in detail is Michigan.

It would seem to me to be very advisable if we could publish our figures giving the number of cases of different diseases reported, the case rates per 100,000, and the number of deaths from those same diseases, and the death rates from those diseases. I do not wholly agree with Dr. Tuttle about the fallacy of the mortality rates. If we do not use the populations given by the Census Bureau, let us have no mortality rates at all: let us forget the whole thing. I do not think we can do anything better than to hope that in the future the census will be taken for the purpose of finding out who and

where all the people are, instead of attempting to find out the population for purposes of political representation; and when we can once get that, we will have something that will be far more accurate than what we have now.

As to the work in New York there is so much that I would like to tell you about it, and so much that is not being done, and so much more that we hope to do, that it would not be practicable to go into the whole subject with you. But I would only like to reaffirm what I said at the outset, that it seems to me that it is most important for us at these conferences to consider what can be done in the future, and not to expect to get everything done at the present.

Dr. KELLEY. Mr. Chairman, it has been really an amazement to me how well the physicians report in Massachusetts. I think a good deal of that has been due to the work of our district health officers. For example, for the entire State in 1914 there were reported 12,264 cases of measles and 149 deaths. Last year 22,356 cases were reported and 142 deaths. That is interesting in view of the figures Dr. Williams gives for New York.[1]

His statement as to the reporting of German measles being of value in checking cases of scarlet fever is a point that is probably well taken. Occasionally I think you will find that is true. In Massachusetts German measles are not reportable at all; scarlet fever is. Some of the more conscientious physicians are about as liable to report one as the other, and there is a serious drawback to repeatedly asking the doctors to add a lot of things for us in the way of reporting, when we are doing nothing promptly for the physician. When he can see what we are doing his attitude is entirely different.

In the case of diphtheria we have a different illustration. This is a way in which morbidity reports and mortality reports are interesting. Last year there were 9,330 reported cases of diphtheria and 640 deaths; for the last three or four years there apparently has been no decrease in the fatality. It is difficult to say why, because if there is any disease that we ought to be able to control theoretically, it is diphtheria; and if any State ought to control diphtheria it should be Massachusetts, where free antitoxin has been available for over 20 years and where there is every opportunity for laboratory examination. However, until recently our rate since 1912 had slowly increased.

We took this ground a year ago: That of all the communicable diseases, aside from tuberculosis and pneumonia, diphtheria was the only one that constituted a large percentage of the death rate. We have, roughly, 50,000 deaths a year from all causes. Typhoid causes 250 deaths. While that is a serious matter, the death rate would

[1] See p. 41.

be little affected by the saving of those lives. Diphtheria, still causing three-quarters of a thousand deaths a year, however, represents something worth while to concentrate on. So we took the morbidity reports and death reports and made a practice of investigating every fatal case in the State, to get all the details available as to why the patient died, as to whether it was the doctor's or the parents' fault, as to whether there was a contact which came from a previous case that was unrecognized, etc. Some of the physicians were a little resentful at first, but they soon found out what we were getting at and we have had a remarkable diminution in the number of deaths since then. How much of that is actually due to that work it is impossible to say, but I have a strong feeling that much of it is.

That is one use of mortality reports and morbidity reports combined—to make an analytical study of diseases that ought to be prevented; to go right back to ultimate causes; to take every individual case.

In way of exonerating the name of the medical profession, I was rather pleased that apparently fully 80 per cent of the fatalities from diphtheria in Massachusetts are due to failure to call in a physician until the child is practically moribund. There is another percentage, practically 10 or 15 per cent, which comes squarely up to the doctor.

Dr. Woodward. Mr. Chairman, I am in entire sympathy with everything that has been said with regard to the desirability of following up each report of a case by action. The situation reminds me, however, of the poem concerning the young lady who wanted to go to swim. She might hang her clothes on a hickory limb, but she could not go near the water. We are saying that we must have no reports unless we are going to act. In other words, we must have the machinery wherewith to act before we have reports. Now, what justification can we have for demanding machinery for action when we have nothing on which to act? I believe we should approach the subject from both standpoints.

I think we might emphasize that point particularly with respect to cases of poisoning. That brings up a matter in which health officers generally—health officers universally, I may say—have failed in their duty. We have looked on a death from diphtheria or smallpox or typhoid fever as a matter worthy of notice, but we have not so looked on death from violence. We have not looked on the disability due to poisoning or to accidents of any other kind as worthy of the notice of a health officer; we have not looked upon suicides as worthy of notice; and the result is that there has sprung up in every community a most laudable private endeavor in the way of "safety-first" associations, altogether outside of our health depart-

ments. The work that the governments ought to have taken on themselves and done, the work that governments are best fitted to do, with respect to accidents as with respect to tuberculosis, is being done by private agencies. Deaths from violence do play a very important part in reducing the population; and we can read from that the fact that nonfatal accidents play a very important part in creating disability; and anything that results in death and disability through interference with personal welfare seems to me to be properly a subject for action by the health authorities.

In fact, there is very little official machinery of any kind for a proper study of death from disability, accidents, or suicides. You will find in practically every State that where death results there is an investigation; but if death does not result (unless the accident happens to be an accident incident to the operation of some public-service corporation) nothing is done. Of course, States have required accidents to be reported where inflicted by street or steam railway companies, or in the operation of mines (properly public-utilities corporations).

So it seems to me that instead of eliminating poisoning from our list we ought possibly to include accidents and suicides as prospective members of this group. I think we are losing a valuable opportunity for reducing the death rate through a proper study of these two elements in our mortality tables which are certainly to a considerable degree preventable.

One word with respect to the incorporation of deaths in our morbidity tables. In the District of Columbia we have just entered upon a different arrangement. We have already begun a movement toward consolidating all of our morbidity statistics in our mortality tables. Why should we state in one table the number of deaths from a given disease and elsewhere the number of cases? And so the District's mortality tables are going to be gradually worked up so that if you want to find anything about diphtheria you will turn to one table, and that will give you the cases, deaths, and fatality rates.

A single word more with respect to the doctors not being paid for making these reports. Of course, the State does not pay the doctor, in many cases, for making the reports; but it is not fair to say that the doctor is not paid. The State imposes on the doctor a certain restriction with respect to how he shall practice medicine. It says to the physician, "If you attend a woman in confinement, you must make a report; if you attend a case of measles, you must make a report; if you attend a case of diphtheria, you must make a report." That is a part of his professional duty; and in theory—and in fact, if he so desires—he charges in his bill for the service rendered.

The Surgeon General. If agreeable to the conference, the chair will appoint the following gentlemen as members of the committee on resolutions: Drs. Sawyer, Garrison, L. R. Williams, Rucker, and Tuttle.

(Thereupon, at 1.10 p. m., a recess was taken until 2.15 p. m. of the same day.)

Afternoon Session, May 13, 1916.

Reports of Committees—Continued.

morbidity reports—continued.

(The conference was called to order, at the expiration of the recess, at 2.15 o'clock p. m.)

The Surgeon General. If there are no further remarks on morbidity reports, I will ask Dr. Williams to close the discussion.

Dr. E. G. Williams. Mr. Chairman and gentlemen, these points were mentioned in the report of the committee not for the purpose of recommendation, but simply for the purpose of discussion. The questions had been raised by different persons. Personally I am not in favor of adding to the list of reportable diseases. As to erysipelas, we do not now have epidemics of that disease. If we did, it would certainly be a reflection on the surgeon or the hospital in which they occurred. Influenza is too closely associated in doctors' minds with bad colds. Some doctors call all bad colds influenza. As to cases of poisoning, I do not think we should request the report of cases of poisoning. That is too indefinite. Some of the cases of poisoning are unquestionably medicolegal, and not health matters. Most cases of indigestion are poisoning, and I do not think it is practicable to add them.

I want to say that the present system has worked exceedingly well in Virginia. Our morbidity returns have been very valuable. For instance, take typhoid fever. Last year we began noting every case of typhoid fever that was reported. First, we would send to the doctors bedside directions, and then to the householder we would send a personal letter explaining in a simple way how typhoid may be carried, how it can be prevented, and what precautions should be taken. Last year we had a great reduction in typhoid fever over the preceding year—nearly 2,000 fewer cases—in fact, only 41 per cent of the number of cases of typhoid fever that we had seven years ago, when we began getting the morbidity returns.

In regard to diphtheria, the morbidity returns for the last seven years have shown that the minimum number of cases each year occurred in June. October was the month with the maximum number

of cases. In June we would have only about 1.2 per cent of the total number of cases in the State, or 8 per cent of the cases that we had in October. In other words, we would have twelve times the number of cases in October that we had in June. As there are only 100 cases in June, it would appear that, if in this month the proper medical asepsis could be practiced with each of these cases and with the carriers that may be located in their neighborhood, the disease should be most easily eliminated. The statistics show when the campaign should be started to be most effective and with the smallest expense and trouble.

I hope that this present arrangement will be continued. The statistics were formerly gathered by the State board of health. At first 50 per cent of the doctors reported, then later 60 per cent, and when the collaborating epidemiologist was appointed, 80 per cent reported. The franked reports have been a great help. About 10 per cent of doctors are out of place every month,. and they do not send the report, either on account of sickness or being away from home; so that, with 80 per cent of the cards returned, it means that practically 90 per cent of the cases are reported.

I consider the morbidity returns a most valuable feature of our health work.

Dr. L. R. Williams. Mr. Chairman, it is quite evident to me that in discussing morbidity reports what has really been of particular interest to all of us has been the fundamental principles of the control of communicable diseases and the fact that we have utilized morbidity reports for that purpose. Now, it seems that each and every one of us would like very much to tell what our experience has been and what we are doing. There must be a great many of us who are doing things which are valuable, and it would seem to me very well worth while if we could collaborate with each other during an entire year, and endeavor to formulate some standard method of procedure in the control of communicable diseases. I would like to suggest as a resolution, therefore, that the Surgeon General appoint a committee, the number to be decided by him, to consider the standard methods of the control of communicable diseases, and to report to us at the next conference.

The Surgeon General. If there is no objection this resolution will be referred to the committee on resolutions.

New Business.

As the reports of the various standing committees have now been made, we will take up, under the head of new business, the subject of collaborating epidemiologists.

COLLABORATING EPIDEMIOLOGISTS.

Dr. TRASK. I thought that the most interesting way in which that could be handled, Mr. Chairman, would be to let each collaborating epidemiologist tell briefly for the benefit of the other members what he has done in his State.

The SURGEON GENERAL. I will ask Dr. Bracken to open the discussion.

Dr. BRACKEN. Mr. Chairman, I hardly feel like taking up the question by telling what the States have done, because I think that if we follow that policy, we will get into an experience meeting that we shall never be able to get out of; but I will say that, as collaborating epidemiologists in Minnesota, we are simply compiling the result of the month's regular epidemiological work and sending that to the Surgeon General, and that in addition we are sending him reports of smallpox, as requested, for various districts.

Dr. Chesley, as director of the division of preventable diseases, has under him two epidemiologists, and he follows his records closely, getting not only the reports of cases but also reports of releases. I would therefore like to ask him to discuss the question of collaborating epidemiologist in Minnesota.

Dr. CHESLEY. In Minnesota the reports are made in conformity with the instructions of the Surgeon General's office; that is, every Monday night there is a telegraphic report made of the number of cases of smallpox in newly affected sanitary districts. Whenever there is an outbreak of smallpox in which fatalities occur there is a special telegram, which is followed by a letter giving detailed information. Then there is a monthly report which gives the number of cases of notifiable diseases from the State as a whole.

As to reciprocal notification of communicable diseases, by a special letter to the State or provincial health authority concerned we refer all information we can obtain relative to cases treated in Minnesota apparently infected outside the State, or which leave Minnesota in an infectious condition, such as open cases of tuberculosis, trachoma, typhoid carriers, etc.

Dr. BRACKEN. I would like to supplement what Dr. Chesley has said by stating further that we not only take the reports that are sent in by physicians of these cases, but that we watch every possible clue—newspapers and letters that come incidentally to us—and note whether the cases that we pick up in this way have been reported regularly. If not, we follow them up, and I think there is a good deal of follow-up work that Dr. Chesley did not emphasize enough.

Dr. CHESLEY. The follow-up work relates not infrequently to work outside the State. For example, in 1914 there was a sharp outbreak of typhoid in a small town in Minnesota. We searched the hotel

registers and sent lists of names, with the addresses given in the registers, to 18 different States and four Canadian Provinces, so that, if any of the 147 nonresidents of Minnesota who had been in that town during the time when its water was polluted should come down with typhoid fever, the local authorities would be aware of the source of the exposure. We received returns of only two cases outside of Minnesota. Through our local health officers we followed up all Minnesota people known to have been exposed. However, there were many transient workers, such as harvest hands, of whom we could get no record. It is not known whether any of them developed typhoid.

The Surgeon General. We would be glad to hear from the other collaborating epidemiologists present.

Dr. Hayne. Mr. Chairman, so far as the State of South Carolina is concerned, I think that the plan has been of use in this way: We have used the franked envelopes to write to physicians in order to obtain morbidity reports, and they have paid more attention to an envelope with the frank of the United States Government on it than they have to the State board of health envelopes. The physicians in my State have become accustomed whenever they get any letter with "State board of health" on it to put it in the wastebasket at once without further investigation. In fact, we have gotten so that we do not use anything except plain stationery, so that there is no clue to the fact that it may be an inquiry from the State board of health. Now, when we use these franked envelopes, and put ourselves down as collaborating epidemiologists of the United States Public Health Service, they do not confuse us with the State health officers, and they very often make reply to the letter. The physicians see that it is not just an unnecessary inquiry on the part of the State board of health for morbidity statistics, but that the United States Government thinks it of sufficient importance to get these statistics to appoint a physician as collaborating epidemiologist. That makes a physician realize that the getting of morbidity statistics is a necessity for a health department, whether it be the United States health department or the State health department. I think in that way the collaborating epidemiologists have done a great deal of good. I think they could do more good if we could get better cooperation on the part of the local health boards in the cities. We get very little cooperation from them. They get reports, and get better reports than we do, but they fail to turn them in to us.

The only disease that I can honestly say that I get the reports from in South Carolina is diphtheria. I do not think that I miss in the State more than 10 cases a year, if that many. Dr. Williams has said that June was the month in which they had the least diphtheria

and October was the month in which they had the most diphtheria. That is true in South Carolina, except that our maximum does not occur in October. If it did occur in October we could readily understand it, because the schools open about the middle of September, and there should be a rise because of contact of the children at the opening of school. But our highest number of cases is from the 1st to the 15th of September, when the schools have not opened. That evidently shows that it is a seasonal incidence of the disease and is not due to the gathering together of the children. We have been able to have the curve of diphtheria prevalence shown now for five years. The reason why I say that we do get those reports is simply this: That we furnish, as you may know, diphtheria antitoxin free to everybody in the State, rich and poor, black and white, and there is no diphtheria antitoxin sold in the State at all. There is none in the drug stores, except that which is furnished by the State board of health. Consequently, if a case of diphtheria occurs, the doctors have to go to the drug store and get the package of diphtheria antitoxin. In order to obtain that package they have to register the name of the child, its residence, and the physician in attendance. In that way we get an absolutely accurate record. Last year we had in the State 1,975 cases of diphtheria, and we had 74 deaths, which is a pretty good record. That is about as good a record as you will find anywhere.

Now, whether in all the fatal cases they used diphtheria antitoxin or not, I do not know; but I do know that in the 1,975 cases that were reported diphtheria antitoxin was used. Whether every one of those 1,975 had diphtheria or not (as a matter of personal error on the part of the physician) it is impossible to say. Where one physician will call it diphtheria another one will call it septic sore throat and another one will call it tonsillitis.

So we can not put too much dependence on our morbidity reports. In the lower part of the State every continued fever is reported as malaria; in the upper part of the State every continued fever is reported as typhoid fever. Those things, of course, enter into the question. But if you find, as Dr. Williams brought out, that from various States you can map out a curve for diphtheria, you are getting at facts. And there must be some reason for the seasonal incidence of diphtheria which we have not yet discovered; there must be some reason for the seasonal incidence of malaria; there must be some reason for the seasonal incidence of typhoid fever; and all those things will have to be worked out. In other words, the morbidity reports give us phenomena the causes of which must be discovered by further study.

Dr. Garrison. Mr. Chairman, I anticipate that our work is very similar in different States. In addition to making the reports that

have been suggested, the collaborating epidemiologist in Arkansas sends out every month (or did until last fall) about 2,500 cards to all the physicians in the State. That is done for Dr. von Ezdorf, who is collecting some morbidity statistics on malaria for the Public Health Service. Since that time we have been sending them out quarterly.

With reference to the reciprocity idea, I received over a year ago a notice from either Minnesota or Wisconsin, I have forgotten which, that a person had developed typhoid fever a day or two after arriving there from Arkansas. The patient's residence in Arkansas was given me. No typhoid was found there, but in another community where this person had been a short time before I found nine cases of typhoid, all having developed from an imported case living on the crest of a hill, due to contamination of surface water supply. That information from Wisconsin or Minnesota was worth a good deal. I believe that we can develop the system considerably as we get our local organizations better systematized, and in that way render a great service to each other.

I see the question here, under (b):

To appoint collaborating epidemiologists at a strictly nominal sum, such as $5 per month.

Unfortunately, in Arkansas we have a very limited appropriation, due to the governor's veto; and in some instances I have had to call in extra assistants in order to get out these cards. Therefore, I would suggest that the salary be raised from $25 a month rather than cut, especially in those States which have a very limited appropriation.

The Surgeon General. I would like to say in this connection that the bureau desires to have a collaborating epidemiologist in every State, and that whenever a State adopts the provisions of the model law and notifies the bureau that morbidity statistics are being collected, it has been the custom, if funds were available, to appoint some one in the State health office as collaborating epidemiologist. This official then has the franking privilege, is given official stationery and blanks, and is required to make reports to the bureau. These reports are received, compiled, and published weekly by the Division of Sanitary Reports and Statistics.

Dr. Tuttle. Mr. Chairman, I do not know how much our work differs from that in other States, but I do know what the collaborating epidemiologist means to us. We are now getting reports from the smallest health offices in the State, and we get them fairly promptly, whereas before we had the epidemologist's cards there were a good many of them that we did not hear from at all.

But the collaborating epidemiologist plan has done more than that by reason of the franked envelope and the official stationery.

We had a little outbreak, about eight or nine cases of diphtheria, in a town of about a thousand inhabitants, and I was very anxious to make cultures of all the school children's throats in that town. We did not have the money to do it with. We could furnish the culture tubes, etc., to make the examination, but we did not have the money to send a man there and keep him there to collect the specimens. So, on this official stationery I wrote to the mayor, as collaborating epidemiologist, and got an immediate reply agreeing to bear the expense, whereas he had flatly refused to comply with the State commissioner's request. So it helped us a great deal in that way.

What it has done in the way of reports it is hard for me to say, because we have really been operating only about four months. Last year we made a special effort on typhoid fever. In 1914 our records show a death rate of about 20 per cent of the cases reported from typhoid fever. In 1915 we had a death rate of 13 per cent. For the first three months in 1916 we show a death rate of 11 per cent. The other two years studied showed that we had a higher death rate—that is, we had a smaller report—in the first three months than we did later. So we hope (and we believe that we have reason for the hope) that in 1916 we will show a death rate of 10 per cent or lower from typhoid fever, which I believe indicates a fairly complete report.

Last year we had a very much smaller report of measles and whooping cough in proportion to the number of deaths.

The thing I wish we could have would be a franked card for the doctor. If we had a franked card for the doctor, we would get some cases that we do not get now. We understand now that only health officers can use the franked card. And I do not see, gentlemen (I feel that this is something that we ought to take up, although it does not exactly pertain to the subject), why information on how to care for the calf can be franked under this Smith-Lever bill to anybody on earth who happens to be a farmer, and we can not send him a baby bulletin without putting a United States 2-cent stamp on it.

The Acting Chairman (Dr. Kerr). Dr. Trask, have you a word on this point?

Dr. Trask. I just wanted to answer that question, in order to correct any misunderstanding there might be. There is no difference. The Government official can use a frank on official business at any time and any place. No one else can use a frank at any time or any place, except under the terms of the law. The law reads:

Relating exclusively to the business of the Government of the United States.

Dr. Garrison. At the present time the Public Health Service has a man in Arkansas making a survey of schools for the purpose of determining the percentage of the feeble-minded, and I have been using the franking privilege to notify the teachers, directors, etc., that this

survey is going to be made by Dr. Treadway at such and such a time. The question was raised in the office as to whether or not I was infringing that right. I used the franking privilege and stated that he would make the survey at such and such a time, and that he was collecting the data for the Government.

Dr. TRASK. That is perfectly proper, because it is about business that Dr. Treadway was doing, and Dr. Treadway could not be doing any work for which he draws his salary unless it was work for the United States. So you, as another official of the Government, could write in regard to the work that Dr. Treadway is doing, and you would be subject to criticism did you not use the frank under such a condition as that.

Dr. BRACKEN. If the collaborating epidemiologist can write a letter asking some one to report facts to him because he is collaborating epidemiologist, the man who replies has the right to use the frank, too; that is, you give him a return envelope?

Dr. TRASK. You can give him a franked envelope, but it must be addressed to you as a Government official.

Dr. SWARTS. What is it necessary to comply with in order to have the privilege of having an epidemiologist? For instance, in our State what would you require?

Dr. TRASK. The main essential in the past has been the necessary money for the Treasury Department to pay them with.

These appointments are not made to extend the franking privilege. The moment that were done the whole thing would be abolished and, in my opinion, ought to be abolished.

Dr. RUCKER. It occurred to me that it would be a very valuable thing if I were to read the law on the franking privilege, so that there might not be any misunderstanding about it.

Paragraph 5 of section 3913 of the Revised Statutes of the United States says:

That it shall be lawful to transmit through the mail, free of postage, any letters, packages, or other matters relating exclusively to the business of the Government of the United States: *Provided*, That every such letter or package to entitle it to pass free shall bear over the words "Official business," an indorsement showing also the name of the department, and, if from a bureau or office, the names of the department and bureau or office, as the case may be, whence transmitted. And if any person shall make use of any such official envelope to avoid the payment of postage on his private letter, package, or other matter in the mail, the person so offending shall be deemed guilty of a misdemeanor, and subject to a fine of $300, to be prosecuted in any court of competent jurisdiction.

In paragraph 29 of the same section it says:

Any department or officer authorized to use the penalty envelopes may inclose them with return address to any person or persons from or through whom official information is desired, the same to be used only to cover such official information and indorsements relating thereto.

Dr. BRACKEN. I wish to thank Dr. Rucker for bringing this before us.

PROGRAMS OF CONFERENCES.

The ACTING CHAIRMAN. At this point there is some rather radical change in the program, and it might be pertinent to state that the subjects from now on are brought together not with the idea of taking any very definite action at this time. These programs, I confess, are made up by the officers of our service, and represent in large measure the subjects in which we are interested and with which we are confronted. I have felt sometimes in the last 10 years that we perhaps missed the mark in preparing the programs, and that subjects of interest to the State health departments have not always been selected. I feel, though, that the subjects that are ahead of us are of especial interest, and they all hinge on the question of what shall be the powers and duties of State health authorities; in other words, the scope of State health departments.

The tendency in the present public health movement, and in the recent past, has been, it appears to me, to disassociate in many instances strictly health work from health departments. In Massachusetts, for instance, the control of factory sanitation has been removed from the State board of health. Am I not right, Doctor?

Dr. A. J. MCLAUGHLIN. Yes; about two years ago.

The ACTING CHAIRMAN. In other States other subjects have been disassociated; and it has seemed to me that we should discuss at least what should come under State health departments, and if the subjects that we agree upon are not in our State health departments the effort should be to get them there, and in the meantime the effort on the part of our service should be frankly to recognize that we must cooperate with other agencies in a State as well as the State health department; if all the health work is not done by them, in our educational work and research work at least, we must turn to other agencies in addition to the State boards of health.

Dr. BRACKEN. I, for one, think that this program is excellently made up. I think the subjects are all subjects that we ought to discuss, and I do not know how we could formulate a program better than the one you have formulated for us.

INDUSTRIAL SANITATION.

The ACTING CHAIRMAN. If there is no objection on the part of the conference, we will take up the subject of industrial sanitation, and I will ask Mr. Bowman if he will not give his views of the relation that should be borne by the State department of health toward industrial hygiene.

Mr. BOWMAN. In Ohio for several years past we have suffered sadly from occupational diseases, resulting in the organization of a

division of industrial hygiene. We feel that we have done considerable good work, but that more could have been done if the work had not been divided up so much between the other State departments. The Industrial Commission of Ohio has charge of a great deal of the work that should really belong to the State health department. The workshops and factory inspections and other work of the same kind are entirely without our control, and we are not even consulted in regard to the regulations that are adopted and enforced by that department.

Probably all of you have seen the report that was issued by Dr. E. R. Hayhurst, our director of the division, which is probably as good work as we have ever done in Ohio. I do not know whether any other State has done any better. If it would be of interest to any of you who have not received the report, I would be very glad to see that a copy of it is sent. That would give more definite information than anything that I could say in regard to it.

Dr. A. J. McLaughlin. Mr. Chairman, this subject comes pretty close to me. When I came into Massachusetts I found that a couple of years before industrial hygiene had been rudely snatched away from the State health department and placed under a new board called the State board of labor and industries. I know that the basic law under which we work in Massachusetts states that the State health department, formerly the State board of health, must take cognizance of the health and welfare of all the people of the Commonwealth, and it does not segregate them into age groups or into classes by occupation; and there is no way in which our department, under that broad authority, can dodge its plain obligation to consider industrial hygiene, even if certain specific laws bearing on industrial hygiene are placed in the hands of another State department for execution.

We feel that there should be one State board of health in the State, and in the past year several distinct attempts to build up State health departments in Massachusetts — miniature health departments — were frustrated. They were conceived innocently enough, without any malicious design; just carried away by their own enthuasism to do health work. One project provided for establishing a water and sewage laboratory. As you probably know, we have a pretty good water and sewage laboratory now in Massachusetts. Of course, that kind of duplication does not appeal to legislatures. Two other projects that were frustrated had to do with the educational department and the harbor and land commission. Still another one, which, however, is already established and which I am inclined to leave alone, is the vital statistics collection in the hands of the department of State.

I have a feeling that in a very short time industrial hygiene will be where it belongs, back in the State department of health, with all due deference to my very good friends the State board of labor and industries, with whom I am cooperating most heartily right now. A commission appointed by the governor for the consolidation of commissions has considered very carefully the making of some new combination of the industrial accident board, which handles the workmen's compensation act; the State board of labor and industries, which handles industrial hygiene; and the State board of labor and conciliation.

The magnitude of the industrial hygiene problem frightens me. In dealing with it we have been starting at the third or fourth story rather than at the foundation, which is, after all, health insurance. As Dr. Warren suggested this morning, you have got to get outside the factory; you have got to take cognizance of the environment of the individual working in the factory. That brings you back to the question of health insurance.

Dr. Bracken. Mr. Chairman, I want to tell a rather unusual thing that happened in our State. The labor commissioner frankly stated before the last legislature that industrial hygiene did not belong to his department and that he wanted it to go to the State board of health. We did not get it. Our legislature was lined up on the liquor question last year. It was wets and drys, and not labor.

Dr. Jepson. I might say, Mr. Chairman, that the law of West Virginia, which was enacted only about a year ago, gives to our health department considerable control over industrial hygiene. In the upper part of the State, about Wheeling, there are a great many gas and iron works, potteries, etc. Potteries especially are supposed to be instrumental in causing tuberculosis. For several years a large number of cases of tuberculosis had been charged to a plant in Charleston, which is the largest in the world for the manufacture of axes. Two years ago the president of our board, with myself, made a close investigation of that institution, and found that the proprietors were doing what seemed to be in their power to control the disease. Of course, the principal danger of tuberculosis there was due to the grinding operations, and the proprietor stated that he was gradually introducing the emery wheel instead of the stone wheel; that he only had "8 or 10 carloads of stone wheels left," and as soon as those were exhausted the emery wheel would be used entirely.

Only in the past week I sent an assistant to make a sanitary inspection of this institution, supplementing a survey which we had made of the deaths from tuberculosis in that county and which had shown that of 40 or 45 who had died 8 had worked at one time or

another in this ax factory. The assistant reported that the factory, as regards precautions against the disease, was in a very creditable condition; but he suggested a few improvements and suggested also that handbills (which are now in the course of preparation) be placed through the factory, with the consent of the proprietor, giving specific instructions as to how the operatives may, so far as possible, prevent the development of this disease.

The new organization of our health department being only about a year old, the appropriation small as yet, and our office force not adequate for the performance of all of its duties, we have not thus far given a very great deal of attention to industrial hygiene.

Dr. Hayne. Mr. Chairman, the only industries of any great extent in South Carolina are the cotton-mill industry and the lumber mill. The State health department has entire charge of the health condition of these industries; but the commissioner of agriculture, commerce, and labor, very curiously, has control of the amount of humidity that shall be allowed in loom rooms, where they work over the looms. The only other health activity that is taken away from us is the enforcement of the pure food and drugs act. That is also under the agricultural department.

At present we are trying to get some laws passed to have sewerage, etc., put in in different mill villages, and I think we will succeed.

"SANITATION WEEK" OBSERVANCE.

The Surgeon General. We will take up the subject of "sanitation week" observance. We should be very glad to have the views of the conference as to the desirability of designating such special sanitation weeks. I will ask Dr. Lumsden to open the discussion.

Dr. Lumsden. Mr. Chairman, gentlemen of the conference, I am afraid that the chairman's selection of one to open this discussion is somewhat unfortunate, because I am overenthusiastic about sanitation weeks. I believe in 52 every year. Anything short of that is, I think, a dangerous makeshift, and one that I can not seriously advocate.

Every week a "sanitation week" is desirable, but in some instances it may not be practicable. From having one week in the year devoted to the advertisement of the subject of sanitation good results may eventuate, just as from a short religious revival the stimulus may be furnished for better regular services and lasting good. Just what is best to be done within 1 week out of the 52 in the year to start good propaganda for sanitation, I am not sure. I have not had any experience in this particular line of work. I have followed on the heels of a good many sanitation weeks or sanitation days and have found as a rule that most of the cleaning up that is done in

these short-service sanitation campaigns is devoted to the matter which is the least harmful. It is devoted to cleaning up leaves, twigs, waste paper, and other relatively harmless rubbish, and the matter which we, as practical sanitarians, know is the most dangerous dirt in the community from a standpoint of disease causation is neglected. I have visited a good many communities in which a very heroic program had been carried out, and found that the insanitary privies, loaded up to the top board, and numerous fly-breeding heaps of stable manure had not received any attention whatever, but many wagonloads of yard rubbish and old carpets and rugs had been hauled away and burned up, with much enthusiasm. Such clean-ups can have little to do with the conservation of the health of the community and they foster erroneous ideas of the principles of sanitation.

In a sanitation week in a community we, as health officers, should strongly advocate a direction of the attention of the good people having charge of these campaigns to the matter which is the most dangerous. I think it would be better for them to clean up thoroughly 50 insanitary privies and 2 or 3 big heaps of stable manure, which could be done with very little money, than to spend $400 or $500 for destruction of the usual kind of rubbish collected in clean-up weeks or clean-up days. I do not think the people can touch this matter of sanitation without doing some good. But I believe that if the taxpayers of a town are going to spend $400 or $500 for a clean-up, we should encourage them to spend the money in a way reasonably effective for the actual prevention of disease.

The Surgeon General. Dr. Leathers, we would be glad to hear from you.

Dr. Leathers. Mr. Chairman, we have had some experience with this kind of work during the last two years. I think Dr. Lumsden is absolutely correct in that there should be 52 weeks in the year during which the towns and cities of a State should be kept clean. But I think it is very important for all of us, as health officers, to realize the fact that there must be at times certain methods instituted which you might call inspirational. In any kind of activity things after a time become rather of a routine nature, and therefore these revival services, which may extend over varying periods of time, are just as necessary, I think, in sanitation as in religion.

Last year, in Mississippi, we were especially successful in engaging the women's clubs in what was termed a "cleanest town" contest. Towns and cities were grouped into those from 1,000 to 2,500, from 2,500 to 7,500, and so forth. The town getting first place in any group received a certain recognition.

I think that we made a slight error last year in not emphasizing the privy proposition enough. That is my hobby. If there is any-

thing which I have talked in Mississippi it has been the privy proposition in practically every community of the State. Last year, while we graded these towns on different things, such as dairies, general sanitation, privies, and different phases of sanitation as applicable to each town, we did not lay special emphasis on the privy problem. However, many of the people in the different towns realized that sanitation of their privies would have an important bearing on the results of the competition. It may have been a coincidence, in a way, but the town which won first place (Magnolia) had every privy sanitated; even the negro homes were clean, and many of the privies were brand new, with galvanized-iron receptacles. I went over the town myself when the contest was concluded, and it was a surprise to me to find the completeness with which the people of that town, especially the women, had worked for this definite result.

This year we have instituted a similar plan, and I might incidentally mention that this campaign extends over about three months and ends with a week of clean-up activity. The governor issues a proclamation, and there is a good deal of recognition given to the last week of the three-month period. This year we have placed on the grade card, in black, a statement to the effect that the privy problem was by far the most important factor in town and city sanitation, and that no town or city would be given first place, or perhaps any place, which did not have the privy problem worked out reasonably well. This year, therefore, I think we will get a number of towns in the State to devote special attention to this problem. For instance, in Jackson, the capital of the State and a city of about 26,000, they are instituting very rigid measures with reference to the privy system and for the purpose of making the people sanitate their homes properly, because they realize that they can not otherwise get first place. I believe that Dr. Lumsden will approve of this method.

Through such instruction I think we will get the people to realize that if it is a good thing for three months it is a good thing for 52 weeks in the year.

Dr. Kerr. This subject was added to the program at my suggestion, but not with the idea that I would attempt to answer the question. It was added because in the bureau requests are received from time to time from individuals and unofficial organizations as to what is the best time to hold a sanitation day or a sanitation week observance, and what the program should be. I do not know whether the same questions have confronted State health officers or not, but it seemed to me as though it might be worth while for this conference and State officers generally to consider what was wanted and what should be recommended.

Dr. Swarts. Mr. Chairman, the subject as presented by Dr. Lumsden, I think, covers the question entirely. The inhabitants clean up their ash heaps and cans and rubbish holes, but such cleaning up is more a matter of esthetics than it is of health. Health brings itself down to the question of the transmission of disease from decaying garbage (which does not produce distinct disease unless possibly through flies carrying dysentery and diarrhea to children) and to the transmission of typhoid from fecal matter. Therefore, it means the control of flies and manure heaps. I think we have taught the people too frequently already that decaying garbage and bad smells produce disease. Nevertheless, it has been the practice in Rhode Island for the last two years to take up the question of "clean-up and paint-up week." I have personally aided and abetted in carrying on this campaign by automobile trips and by exposing my shirt sleeves and person to the moving-picture camera, registering action, with the assistance of the neighboring contingent of women and children, etc. The films were then exhibited in the moving-picture houses to stimulate and keep up the interest in the subject.

But I think the value of it comes here: That by increasing the education and improving the environment of the people you lead them to the question of the removing at periodical intervals, say once in 12 days, of the manure heaps and sufficiently often the fecal matter. The general education of the people strengthens the hands of the health officer.

Mr. Hansen. Mr. Chairman, in Illinois we have been telling the people in the small towns just what Dr. Lumsden has stated, namely, that clean-up weeks are effective in inducing people to clean up once in a while and possibly also in stirring up a little enthusiasm for general health improvements, but that what is really necessary, especially in towns of over 5,000 population, is an efficient system for the collection and disposal of garbage and other wastes, preferably under municipal auspices. I believe that the public-health authorities have neglected their opportunities in the matter of city-waste collection and disposal. State boards of health in particular have given comparatively little thought to it. The only State board in the country that has studied this problem is the Ohio one, and now we are attempting to take up similar studies in Illinois. I should like to suggest here that possibly the United States Public Health Service may also profitably take up the subject of city waste collection and disposal, perhaps on a cooperative basis, with various cities and also with the various State health departments.

Dr. Lumsden. I am particularly impressed, Mr. Chairman, with the interpretation of "sanitation week" which we have had from Dr. Leathers. That is a different kind of sanitation week from what I had in mind when I opened this discussion. I think the kind of

sanitation week which they have tried out in Mississippi and which may be called the Mississippi scheme of sanitation-week observance is really effective. The results have shown it. It is not exactly a sanitation week but a sanitation period of several months followed by a week of inspection.

I do not think that we should compromise on this sanitation business. It is a life-saving business, and to show any disposition whatever to compromise, I think, weakens the faith that the public might have in us. If we say, "Oh, well, we ought to have those things fixed and keep them fixed all the time—52 weeks in the year—but we will have one clean-up week and get clean for once in the history of the town, if we never did it before and never do it again," I do not think that inspires the people with the right kind of confidence. I think we should always stick close to the line that "here is a serious business, and if you once give your attention to it, you are bound to see the sense in it, and once you see the sense in it, you can't think of slipping back on a proposition of this kind. These measures are easily carried out, and the results of letting them slip back are so disastrous that you can't afford to think of taking but one position on a proposition of this serious nature."

I notice in the program that the question is raised as to the desirability of designating such special week. I should think that in the South—that is, south of latitude of Washington—May 1 would be a good time to set apart. Probably April 1 would be better for sections south of the southern boundary of North Carolina. North of Washington June or July would be most suitable. A thorough clean-up of all fly-breeding material, including especially privy contents, at the beginning of summer weather will do some good. According to the observations of Faichnie and others, the most dangerous fly is not the one which has simply crawled over infected excreta, but is the fly which has bred in infected excreta. If we are going to have only one clean-up in the year, I think the time when that clean-up is done will have a good deal to do with the result.

(Dr. Kerr read the following telegram from Dr. A. C. McCormack, secretary of the State Board of Health of Kentucky:

CHICAGO, *May 13, 1916.*

Dr. RUPERT BLUE,

Surgeon General, U. S. Public Health Service, Washington, D. C.:

Please accept sincere regret that State Board of Health of Kentucky can not be represented at the conference. Dr. Heizer and I are detained here on account of the suit brought by manufacturers of Wine of Cardui against the American Medical Association, and our board feels that this is of such importance that we are instructed to remain here.

I was particularly anxious to be present at this conference to express the gratitude felt by the people of Kentucky at the splendid demonstration the

Service has made of the possibility of the eradication of trachoma. We also desire to thank you for effective services in connection with the pollution survey of the Ohio River and numerous sanitary surveys in the State.

The increase in the effectiveness of the Service since you have been in command has been so marked as to command the confidence and respect of everyone interested in the health of the people, and this board desires formally to congratulate you and to assure you of its loyal support. We desire to urge the conference to undertake through their Senators and Representatives to secure increased personnel and necessary increases in scope of work to enable you to help the States to solve especially the problems of rural and small community sanitation.

By order of State Board of Health of Kentucky.

A. C. McCormack, *Secretary.*)

MALARIA.

The Surgeon General. I will announce just one more topic before adjournment. It is one of absorbing interest. As illustrating the importance of malaria in certain sections of the country, I will state that information has been collected by our officials in the field which tends to show that in the Southern States east of Texas, with a population of more than 20,000,000, at least 4 per cent of the inhabitants suffer from an annual attack of malaria. This is a tremendous number when you consider that malaria is a preventable disease.

I will ask Dr. Kerr to open the discussion.

Dr. Kerr (reading memorandum):

The second Pan-American Scientific Congress adopted the following as its nineteenth resolution on January 7, 1916—

"That all American countries inaugurate a well-considered plan of malaria eradication and control based upon the recognition of the principles that the disease is preventable to a much greater degree than has thus far been achieved, and that the education of the public in the elementary facts of malaria is of the first order of importance to the country's concern."

In the furtherance of the objects of the above-mentioned resolution its proponent, Mr. Frederick L. Hoffman, took the initial step February 21, 1916, looking to the formation of a national committee on the study and prevention of malaria.

The following, who were invited by Mr. Hoffman to participate in the formation of such a committee, accepted the invitation:

Dr. C. C. Bass, medical department, Tulane University of Louisiana, New Orleans, La.

Dr. Rupert Blue, United States Public Health Service, Washington, D. C.

Dr. W. E. Britton, Connecticut Agricultural Experiment Station, New Haven, Conn.

Dr. H. R. Carter, United States Public Health Service, Marine Hospital, Baltimore, Md.

Dr. Charles F. Craig, Medical Corps, United States Army, Fort Leavenworth, Kans.

Mr. F. S. Crum, assistant statistician, Prudential Insurance Co. of America, Newark, N. J.

Dr. William H. Deaderick, Hot Springs, Ark.

Mr. W. E. Deeks, United Fruit Co., 131 State Street, Boston, Mass.

Dr. Oscar Dowling, president State board of health, New Orleans, La.

Dr. W. C. Gorgas, United States Army, Washington, D. C.

Dr. Frederick R. Green, 535 North Dearborn Street, Chicago, Ill.

Dr. Seale Harris, editor, Southern Medical Journal, Empire Building, Birmingham, Ala.

Dr. Thomas J. Headlee, New Brunswick, N. J.

Dr. Graham E. Henson, Jacksonville, Fla.

Mr. Frederick L. Hoffman, statistician, Prudential Insurance Co. of America, Newark, N. J.

Dr. L. O. Howard, Department of Agriculture, Washington, D. C.

Mr. Arthur Hunter, 346 and 348 Broadway, New York City.

Dr. W. D. Hunter, United States Bureau of Entomology, Department of Agriculture. Washington, D. C.

Dr. J. W. Kerr, United States Public Health Service, Washington, D. C.

Dr. W. S. Leathers, Jackson, Miss.

Mr. J. A. A. Leprince, Marine Hospital, New Orleans, La.

Dr. Charles F. Mason, United States Army, Ancon, Canal Zone.

Dr. J. Y. Porter, Jacksonville, Fla.

Dr. W. S. Rankin, Raleigh, N. C.

Dr. M. J. Rosenau, Harvard Medical School, Boston, Mass.

Dr. E. R. Stitt, Navy Department, Washington, D. C.

Dr. John M. Swan, 457 Park Avenue, Rochester, N. Y.

Dr. W. S. Thayer, Baltimore, Md.

Dr. R. H. von Ezdorf, Marine Hospital, New Orleans, La.

Dr. Robert Wilson, Charleston, S. C.

A preliminary meeting was held in Washington on May 10, 1916, the following being present:

Dr. C. C. Bass, Dr. Rupert Blue, Dr. H. R. Carter, Dr. E. S. Crum, Dr. Seale Harris, Dr. T. J. Headlee, Dr. L. O. Howard, Dr. M. J. Rosenau, Dr. E. R. Stitt, Dr. John M. Swan, Dr. Robert Wilson, jr., Dr. W. S. Thayer, and Dr. J. W. Kerr.

After deliberation the following motions were adopted:

1. That a national committee on malaria be formed.

2. That the following plans of organization be adopted:

Objects of the committee.—The objects of the committee shall be (*a*) to stimulate interest in malaria problems; (*b*) to serve as a medium through which societies and individuals may become identified with the study and prevention of the disease; and (*c*) to coordinate the efforts of these agencies with constituted Federal, State, and local authorities.

Character of the organization.—The committee shall be a voluntary organization, its members shall serve without compensation, and there shall be no membership dues.

Membership.—Persons who have accepted membership shall be known as charter members.

The executive officers of the State boards of health of States in which malaria exists as a serious public-health problem and State officers charged with the enforcement of laws for the suppression of disease-bearing mosquitoes are invited to become members of the committee. Others interested in the objects of the committee may from time to time become members by vote of the committee.

Meetings.—There shall be a meeting of the committee once annually at the call of the chairman at such time and place as he may deem most suitable. Special meetings may be had, however, on the call of the chairman.

Officers.—There shall be an honorary chairman, an active chairman, and a secretary, to be selected by the committee.

Subcommittees.—Subcommittees shall be appointed by the chairman to carry out the active work of the central committee.

The following subcommittees are suggested: (1) Administration; (2) entomology; (3) medical research; (4) education and publicity; (5) sanitary engineering; (6) statistics.

Problems the solution of which is especially desirable for the control of malaria shall be presented to the appropriate subcommittee from time to time by the central committee.

Executive committee.—The honorary chairman, the active chairman, the secretary, and the chairmen of the subcommittees shall constitute the executive committee of the organization (a majority of whom shall constitute a quorum).

State committees.—It is recommended that State committees be formed in States in which malaria exists as a serious public-health problem.

SUBCOMMITTEES.

Administration.—The duties of this committee shall be to encourage (1) the organization of State committees in affiliation with the national committee; (2) the adoption of antimalarial measures by communities; (3) malarial surveys and demonstrations of antimalarial work in suitable communities; (4) cooperative effort in malarial work.

Entomology.—The duties of this committee shall be to encourage (1) mosquito surveys; (2) mosquito collections; (3) studies of entomological factors of the malaria problem.

Medical research.—The duties of this committee shall be to encourage (1) studies of the life history of the malarial parasite; (2) its effects on man; (3) means for its destruction in man.

Education and publicity.—The duties of this committee shall be (1) to encourage the teaching of the facts of malaria and its control in the schools and, as far as may be, to standardize the subject matter and methods for so doing; (2) to encourage the discussion of malaria in medical societies and other interested bodies; (3) to arrange for popular lectures on malaria to adults and to school children; (4) to interest the public press and encourage it to carry on publicity campaigns on malaria in its columns.

Sanitary engineering.—The duties of this committee shall be (1) to encourage the employment by communities of skilled sanitary engineers, contemplating drainage and other engineering measures for the control of malaria; (2) to confer with those engaged in drainage or impounding projects, so as to obviate the establishment of disease-breeding areas.

Statistics.—The duties of this committee shall be (1) to encourage States and localities to report and record cases of and deaths from malaria by localities; (2) to standardize methods of tabulation to be used for this purpose; (3) to encourage the collection and tabulation of data relating to the economics of malaria.

In conformity with the above plan of organization the following additional motions were adopted: (3) That Surg. Gen. Gorgas be made honorary chairman; (4) that Surg. Gen. Blue be made active chairman; (5) that Dr. Seale Harris be made secretary; (6) that meetings be held on call of the chairman after consultation with the secretary.

The interest of the service in this matter is to endeavor to assist in directing a movement which has already started, and to carry out as far as possible the objects of the resolution read at the beginning of this memorandum. It has always been the idea of the bureau, I think, that Federal, State, and local health authorities should be in a position to lead and to give a helping hand in any movement which was designed to improve health conditions. Here is a movement that is rather loose, but the object to be accomplished is extremely large, and for that reason the service took interest in this and presents this plan as it was adopted at the preliminary meeting on the 10th of May. It is highly desirable that State health officials should accept the invitation extended to become members of the committee and be in position actively to participate in the movement.

Dr. GARRISON. Mr. Chairman, I feel that any remark with reference to that outline is unnecessary. It seems to be rather comprehensive, and certainly timely. It is, as I see it, an attempt to coordinate and correlate various activities in various States in malarious sections, and I think we are more than willing to lend our personal assistance and offices to the furtherance of such an organization. Therefore, if it is in order, I would move that the plan as submitted be accepted and indorsed by this body, and that State health executives become members.

(The motion was seconded.)

The SURGEON GENERAL. If there is no objection, such will be considered the action of the conference.

(Thereupon the conference adjourned to Monday morning, May 15.)

Morning Session, May 15, 1916.

NEW BUSINESS—Continued.

CONSTITUTIONAL DISEASES.

(The conference was called to order at 10 o'clock a. m. by Dr. J. W. Kerr, acting chairman.)

The ACTING CHAIRMAN. We will take up next the subject of constitutional diseases, the extent to which they are public-health problems, and the official measures that may be inaugurated to reduce the increasing death and sickness rates from these diseases. I shall call on Dr. Hurty to open the discussion.

Dr. HURTY. The constitutional or degenerative diseases are certainly increasing. This is, I believe, an accepted fact. And now comes the question, What are we going to do about it? Our title asks, "the extent to which they are public-health problems?" I think they are as much public-health problems as are the acute

infectious diseases. Both are enemies of mankind, bringing suffering, disaster, and pecuniary loss. They lessen efficiency, cut down the sum total of happiness, threaten the race, and are more or less preventable. Surely, the degenerative diseases, appearing generally in the age period of 40 to 60, if uncontrolled, may possibly lessen the number of men of experience to such a serious degree as to lose to society its ballast. "Old men for counsel, young men for war," is an old and true adage, and the balance of youth and age, impulse and conservatism, immature thought and wisdom, must not be disturbed. If it is disturbed society will tip up.

As we all know, the increase in the duration of life noted at this time has a string tied to it. It may not be a blessing to the race for more individuals to reach the age of 30 or 35 and fewer to reach 50 or 60. If saving weak babies and bringing more individuals to middle manhood and womanhood should cause nature to preserve her equilibrium by cutting down the old and experienced, then society will come upon evil days.

And in this connection we might hear Anatole France, who says:

> After all of our efforts to prolong life it remains true that the needs of the species determine the duration of life and nothing else; and all we can do is to live on the best we can, knowing that things are as they are and the results will be as they will be.

And further in this line of philosophy, hoping it will be helpful, I quote again from France as follows:

> After all the reforms men are, as before, egotistical, greedy, cowardly, cruel, stupid, and furious in turn, and you always find about the same number of new-born babies, married people, fools, and hanged men, by which is manifested the order of society. The order is stable, and nothing can possibly upset it, because it is based on misery and human imbecility and they are foundations we shall never lack.

And permit another quotation, which is from Davenport and which bears upon the subject before us. He says:

> Recent studies in heredity show it to be probable that every disease, every particularity of form, structure, and conduct of human beings are determined in great part by a hereditary factor. The nervous history of every child is thus, within limits, predetermined at the moment of conception. From this point of view the germ plasm carried by the parents becomes of paramount importance. The family physician, after becoming cognizant of a contemplated marriage which must lead to nervously defective or weak offspring, should take steps to prevent its consummation.

And continuing, he further says:

> If the rules of professional secrecy regarding matters of importance to progeny work against social progress, then they are in so far immoral. The physician should take an active part in race hygiene, or he may be replaced in this capacity by the rise of a new profession.

And here in this organization we possibly see one nucleus, from which this new profession will rise or be born, or possibly is already born.

If only a part of the above-quoted philosophy is true, then it is apparent that any method of fighting disease other than genesis, as far as the race is concerned, will come largely if not entirely to naught.

Keeping pathogenic microbes out of our bodies, or their utter destruction—which is hardly possible—or the securing from birth of bodily tissues able to repel invasion, will prevent degenerative as well as zymotic diseases.

The latter way is premier, but is lightly recognized, and when recognized is unpopular, principally because it is fundamental and so very practical. A large maker of wagons told me "hickory is the only wood which makes strong wheels. It is becoming very scarce and the time is near when wooden wheels on wagons and buggies will hardly be seen. Hickory," said he, "stands stress, strain, and rot." We note these qualities are given to hickory in the beginning; they can not be acquired. Strong tissues, inherent with resistance and longevity, will bear great burdens and can not be crushed except by most extraordinary pressure. The first step therefore in disease prevention is the securing of strong resistant tissues to the coming generation—the week must not breed—and then, second, living sensibly. The rush for wealth and position is not sensible. Neither is overeating, or the eating of other than plain foods. And as for the absorbing of alcohol, caffein, nicotine, morphine, spices, and other drugs, such is foolishness itself.

Probably the prevention of the degenerative diseases takes precedence over the prevention of those known as acute infections, for they may bring more weakness and inefficiency into the world than the latter. Anyhow, as said in the beginning, I am sure the degenerative diseases are public health problems, and I believe their prevention in any degree will be attended by corresponding results concerning infections. Official measures would be almost entirely educational.

Let hygiene place plainly and forcibly before the people the fact that, as we can not gather figs of thistles, neither can we have strong progeny from weak parents.

A strong, virile race, resistant to disease, can not come out of weak, nonresistant germ plasm. "When conception takes place, the gate of gifts is closed." Then, given the real material, let hygiene teach sensible living.

Dr. Rankin. Mr. Chairman, I think the subject Dr. Hurty has brought up here is one of the most important and timely subjects

which can be considered. I like to think of this problem as a condition of what, in talking to the people, I have called, for want of a better term, the vital social unit. This unit is that group of people out of whom one dies each year—a group of from 68 to 70 people.

The point I wish to make can be represented graphically. Let a square stand for this vital social unit, with the figures "68" in it. In the lower left-hand corner place a cross representing the dead man—the lowest level of physical efficiency (0 per cent). A little below the upper right-hand corner place a cross, representing the individual of the group who has reached the highest degree of physical efficiency (from 90 to 94 per cent). Draw a curve connecting these two crosses. This will be the life line of the vital social group, and at various points along this line crosses can be placed representing the other persons of the group. About two of these will be in bed all the time, some of them will be at a level of only 10 per cent efficiency, others at 20 per cent, etc.

The interesting thing about that line and about what Dr. Hurty has brought out is this: Where is the most important part of the line, so far as increasing the physical efficiency of the individual is concerned? If we start working with the lower end of the line, we can spend an enormous amount of money in raising those people 5, 10, or 30 per cent in their physical efficiency (in their ability to state and to grasp an idea and apply it to life, or to enjoy life), and yet we have accomplished very little. It is worth more to this country to raise the physical efficiency of Dr. Hurty or Dr. Graham, president of the University of North Carolina, 1 per cent than it is to save the lives of a hundred persons belonging to certain classes in North Carolina and Indiana.

The upper end of the line is the one to work with, as Dr. Hurty has indicated. The further we let a fellow slide from the right-hand corner down the incline the more money we will have to spend and the harder we will have to push to get him back.

We talk about saving the lives of babies and children. If you save the life of a baby you have saved, economically considered, about $500; but if you save the life of a man 30 years old you have saved $4,000. It is worth eight times as much to this country to save the man's life.

Dr. Hurty brought out another thing which we have got to change our ideas about in preventive medicine, and I wish simply to repeat what he said in another way for emphasis. Most of us think that typhoid fever and pneumonia and tuberculosis are very important diseases. I want to tell you that pyorrhea alveolaris is probably more important than typhoid fever, with all due respect to Dr. Lumsden, who is specially interested in the latter. Here is a man with pyorrhea alveolaris. His efficiency is pulled down just

about 2 or 3 per cent per day from the constant absorption of poisons, from the slight indigestion which he gets from swallowing these poisons and a lack of mastication, perhaps from rheumatic attacks which he now and then has. Typhoid fever may cost a man about $400 from the time he gets into bed until he gets out and pays his doctor and his druggist; but the man with pyorrhea alveolaris has lost three, four, or five thousand dollars as a result of prolonged impaired efficiency. Similarly, the man who loses $50 out of his pocket at one time thinks that $50 is more important than an expenditure of from 5 to 15 cents a day, which would be something like $1,000 in 20 years.

You do not have to increase a man's ability to grasp an idea more than just a little bit, 2 or 3 per cent, to increase the man's income in all kinds of ways. You can see that. Here is a fellow getting $1,000 a year, to take a material illustration again. You only increase the man's salary $200. That is not a big increase, but on the income of $1,000 a year that man was not saving but $100 over and above his expenses, and now it is possible for him to save three times that much, and it is the reserve that counts. The point that Dr. Hurty brings out here is a most important one. This idea of starting with the well, with the physically valuable, and the idea of cutting out these diseases which we have not recognized the importance of, these minor things, the 20 per cent of constipation in this country, the pyorrhea alveolaris, the excessive eating and such things, is worth consideration. We must put a new health idea into the minds of the people, and it is coming right along this line.

The Acting Chairman. As previously stated, this program was arranged with the idea of taking stock, in a measure, of those problems that we, as State and Federal health officials, should take into account. This particular topic might seem to have been rather far-fetched; but I feel that it is not, and that we as health officers must consider it.

Several years ago, when the antituberculosis movement was begun, it was, in a measure at least, an unofficial effort, and continued so except here and there, and the States and health officials generally did not take as active a part in it as they should have done and as they perhaps would have done had they inaugurated it. It is for that reason that these subjects are presented this morning.

Dr. Lumsden. Mr. Chairman. I wish to suggest in this connection the possibility that the ills we bear in our early life as a result of grossly insanitary conditions in our environment may have some effect on our future health and efficiency after we have reached the age of 40.

The prevention of hookworm disease is, I believe, one of the crudest problems which we have in our whole public health field. Yet a

human being who, from the age of 2 to the age of 20 years, has been burdened with a severe hookworm infection has not as good a chance of being, after he has reached the age of 40, a strong, able human unit in our conservation system as he would have if he had not been so burdened and had his vitality not been sapped through his early years.

Dr. JEPSON. Mr. Chairman, it occurs to me that the gentlemen who have spoken have not offered a solution of the problem or any specific means whereby we can prevent this degeneration in middle life and after.

Some one has said that intimate acquaintance with Venus, Bacchus, and Vulcan has much to do with the degeneration observed after 40 years of age. I may be permitted, possibly, to cite my own case as one who has not made an intimate acquaintance with any of those characters, and in addition as one having had an heredity that was favorable; and I find myself to-day, if none of you will tell it in West Virginia, 74 years of age and in reasonably good physical condition.

Therefore, I would suggest that you begin instructing the young people as to the importance of a good heredity. Most of our sanitary work, after all, is teaching. If we can make a good start by having a couple vigorous in mind and body, and then if they will avoid the acquaintance of these celebrated characters of history to which I have referred, I think they may find themselves in the northeast corner of Dr. Rankin's chart, where I claim to be to-day myself.

Dr. RUCKER. Mr. Chairman, quite a number of the officers of the Public Health Service have at one time and another discussed the problem of where this hygienic sanitary movement is leading us, and I have heard very grave doubts expressed as to the ultimate value of it all, because the claim was made that after all is said and done it aims at the perpetuation of the unfit; it aims to take care of the man who has not brains enough to take care of himself.

It seems to me that this paper this morning answers the question—that instead of perpetuating the unfit we should endeavor to produce more fit. When we have done that, then we have balanced what we are doing in the perpetuation of the unfit.

Of course, it seems as though education were the great thing. I entirely agree with the thought that education is essential; but I do believe—and I can speak on this point freely because I have been as guilty as anyone—that education does not mean merely the spoken and the written word. I believe we have gotten to a point in our work where we can educate by demonstration; and after all, that is what the people of this country want. They want to be shown. They want to have something very definite and tangible that they can reach out and put their finger on.

I think what we have got to do is this: We have got to talk less and do more. We have got to deliver more goods to the people of this country if we want to continue to do the health work for the people of this country. While I agree with the idea that Dr. Rankin sets forth about the man with typhoid fever and his loss of $400, the study of mankind shows that the adult has to have a good, severe lesson of that kind in order to learn it. All or practically all of the Federal health legislation of this country has been brought about by reason of an epidemic or the fear of an epidemic. There the people had a demonstration right before their eyes; and I think we would be very wise if we would follow that system in the psychology of our work.

You take, for example, the model town that Dr. Lumsden has created. There it is true that he gives them a certain amount of the spoken word, but with it he hands them a practical demonstration. Faith without works is dead, and it is the works that count in this sanitary problem. If we can give the adult a definite demonstration, he will do something.

Now, as regards the teaching by other means, I think there is just one point to think about, and that is this: That you can not make an adult, by ordinary teaching, change his hygienic habits. You must rely for your spoken word upon the child whose mind is plastic and expect to get your results in 30 years.

Dr. HURTY. One point with regard to what Dr. Rankin said. It is true that it is more worth while to save a man who is 30 or 40 or 50 years old, or increase his efficiency somewhat, than it is to save a baby. As a financial proposition it is sound. And it is also true that it does not matter how well born a baby is and how strong it is, if it is not put into the right environment it will not live, it will not develop, and it will not have the proper equipment when it gets older. You must go back behind youth. Rotten parents can not breed strong children.

Now, in regard to education, you can not educate an idiot, a moron, a mental defective. You can only educate those who have been born with a sound brain, with a proper moral disposition to receive education, and with a power in their inherent make-up to apply it. If they have not these qualities they must perish. You can not preserve them.

Oliver Wendell Holmes said:

> If you want to live long, you must acquire a deadly disease and take care of yourself.

But what is the use of saving a person with a deadly disease? Such can not be useful to society. They only prolong their days of sorrow and misery, and will probably increase the burden upon society.

Death is not such a horrible and awful thing. It is one of the greatest blessings we have. The destruction of a person when his career is ended is high human economy. We should be well born, with good tissues—liver tissue, kidney tissue, heart tissue, brain tissue, nervous tissue, all tissues of such high quality that they will stand the stress and strain and weight and burden of life.

With strength given, of course, environment, education, proper nutrition are necessary. One of the greatest banes of life, and one that is bringing a great deal of sickness, is the unnecessary medicine we take. I find, upon consulting the United States statistics, that the people of this country spend $500,000,000 a year for medicines. That is about four times as much per capita as any other nation spends. All know medicines are injurious. I believe that if there are any benefits attendant upon this terrible war in Europe, one of them is that it has cut off the German supply of synthetic remedies. It has stopped the importation of aspirin, acetanilid, and all those damnable synthetics we have been getting to our detriment and the degeneration of our race.

My remedy is to have mankind well born. That is perfectly possible, though, of course, it can not be done immediately. It is indeed a big job. Then the well born, those descended from good stock, will turn out well.

A man in Indiana had a reputation as a raiser of hogs, and his hogs did not have cholera. I called to see why they did not have cholera, for the farmers all around him had it among their hogs. He said:

> Well, first, these people don't pay attention to their stock. They take any old stock; and then, second, they don't take care of it when they get it. They let the animals wallow in the stream. Then if the hogs up the stream have cholera, no matter how good and well bred the stock is below, they get it.
>
> I buy a good many hogs. I buy, say, a group of 10. I put them in quarantine and see whether or not they develop any sickness. If they do, I do not fool with them; I do not try any medicines; I kill and tank them. Suppose one of the 10 does get sick—I have nine left. Then I move the nine to another quarantine pen and let them "weather" to be sure that there is no infection to follow; and generally the nine will come through. Then I turn them in with the rest of the herd and then surround them with good sanitary conditions, as you see.

He kept them on hillsides mostly. He did not let them wallow in streams or pools, but hosed them off on his brick table, as he called it. "That is a good thing," he said, "but I want to show you what I think is the great thing in raising hogs and getting rid of cholera." We went toward a pen where there was a rather large hog house. He called "Hoo! Hoo!" and out came a great big boar about as large as a rhinoceros, and he said: "His babies don't get sick. That is all there is to it."

COMMITTEE ON RESOLUTIONS.

The Acting Chairman. I understand that Dr. Lindsay Williams, the delegate from New York, is not present. I will therefore ask Dr. Rankin to take his place on the resolutions committee.

SCHOOL HYGIENE.

We will now take up the subject of school hygiene, and the scope of this work so far as health officers are concerned.

Dr. Bracken. This is logically a public-health problem, but apparently educational authorities want to assume these responsibilities to a great extent.

Up to the present time State health authorities quite generally have not been in a position to assume the responsibilities relating to school hygiene because of (*a*) lack of authority or (*b*) lack of funds.

State educational authorities have done little or nothing of importance up to the present time as bearing upon school hygiene, even though they may in some instances at least have had both (*a*) authority and (*b*) funds. This is not strange, for they are dealing with problems of which they have little practical knowledge.

Educators have argued that boards of education are (*a*) more stable, because less influenced by politics and other outside matters, and (*b*) better prepared both as to stability and financial conditions to handle these problems than are boards of health. This may be true in some of the larger cities, but so far as relates to stability and freedom from political influence it is not true, for some States at least. So far as relates to funds it may be true in most instances for both State and municipality.

School hygiene has been in the hands of educators up to the present time. In many States and in most of the large cities there has been little, if any, progress made during the past 15 years in the development of this most important work. Why? Because educators do not know how to handle the problem, and apparently they are not willing to turn it over to health workers who should know how to handle it.

There is no satisfactory system as far as relates to school hygiene to-day in the United States. There are isolated cases, both State and municipal, where good work is being done, but this is due to individual efficiency or accidental conditions rather than to any well-organized system.

If one reviews the present condition of school hygiene it would appear that educators had surely demonstrated their inefficiency for such work. This is not strange, for they have had no preparatory training along these lines. Wherever good work has been

done it has been under the supervision of medical men who have had preliminary training or have trained themselves after receiving appointments. This latter method of training is lacking both in economy and efficiency.

It would appear that the time was ripe for putting school hygiene on a proper basis. To do this there should be under every State health organization a division or bureau devoted exclusively to school hygiene. This division should have control of all sanitary problems relating to (1) the construction and equipment of school buildings, (2) the operation of school buildings, and (3) the medical supervision of school children so far as pertains to (*a*) mental or physical defects, (*b*) preventable diseases, (*c*) open-air schools, and (*d*) open-air schoolrooms.

Such a division should have control of all rural schools and of schools in the smaller municipalities.

In the larger cities there should be a division in the health department devoted exclusively to school hygiene, unless the health department is weak in organization and under the domination of politics. If these latter unfortunate conditions should exist in a city, then the department of education may undertake to do the work, but it should be understood that this is not one of its functions and that the performance of these duties by the board of education should be considered a criticism on the efficiency or financial ability of the municipal board of health.

If a health department has no funds and a school board has, it might be wise for the latter board to pay the salaries necessary for physicians and nurses, but this should be with the distinct understanding that it is done not as a question of duty but of expediency. If under such an arrangement the employees of the board are not satisfactory to the board of education, the latter can protect itself by the withdrawal of funds, if necessary. Such a scheme as outlined above would call for a degree of unselfishness which I am willing to admit is hardly to be expected.

All State health authorities that have given close attention to the control of the spread of disease know how helpless school authorities are in rural and semirural districts when it comes to the handling of such problems. On the other hand, they are fully informed as to how easy it is for a well-organized health department to control the spread of disease in schools.

Although much has been recently written relative to progress made in sanitation as relates to the construction and operation of school buildings, it is easy to find conditions in many of the most recently constructed school buildings which are subject to most severe criticism as relates to orientation, lighting, heating, and ventilation.

The teaching of hygiene in schools is a function of the department of education, but this department should avail itself to some extent of opportunities for instruction to be given by public health workers.

Dr. A. J. McLaughlin. Mr. Chairman, I quite agree with Dr. Bracken that school hygiene, including medical inspection of school children and the teaching of hygiene, should be a function controlled by the State authorities, and I also believe that it should be controlled by the State health authorities.

The effort by the Massachusetts Department of Education to form a division of child welfare which would have charge of child hygiene and the inspection of schools was not maliciously done. It was done through an excess of enthusiasm on the part of the educational authorities, in view of the fact that nothing was being done by the State board of health to coordinate the medical inspection of schools; but I think we convinced the legislature that there should be one department of health in the State, and that every dollar appropriated by the State for the prevention of disease should be spent either by that department or under its direction and advice. They withdrew their effort, and we are now going to attempt to supervise the medical inspection of school children in the State in our subdivision of child welfare.

The school as an agent in life saving and disease prevention is not appreciated. I believe that it is the biggest instrument in public-health work to-day for the prevention of disease; and I know of nothing else that in the future is likely to come in as a competitor in results, except, perhaps, health insurance.

It may be many years before we utilize either of those instruments to their full possibilities; but take the child, for instance, who is our most direct point of attack on a problem like tuberculosis, and it is pitiful to see the way in which this instrument has been used in Massachusetts. We have a law there which makes it compulsory to have medical inspection of school children—a so-called school hygiene law—and yet in 100 different places it is done in 100 different ways, according to the individual dictates of the man who happens to have charge of it. One man has a mania for adenoids; another can see nothing but teeth; another man thinks his only function is to find the contagious diseases of childhood, and the educational authorities often encourage him in that, and that is where his work begins and ends. Some health officers will have nothing to do with school children except in a case of scarlet fever. They do not recognize that child hygiene is broader than that, so far as the health officer is concerned. They say: "Our work goes to the line of measles and scarlet fever. Then the educational authorities take it over."

I believe a real system of child hygiene should carry the child through. so that not only the physically weak and mental defectives are found, but, more important than all, the well child is kept well, and the standard of those who are below par is raised.

The question of authority comes up. I do not believe you need any authority where you have a law requiring the medical inspection of schools. I believe that we can get results in Massachusetts without any specific authority being given us over the local communities. I think we can correlate their efforts and bring some order out of chaos without any further specific authority.

As to who shall do it in the cities and towns, I think Dr. Bracken has well said that in many places the board of health has not the appropriation or equipment to go ahead and do it; and, after all, gentlemen, we must remember one thing, that our schools are financed primarily for education, and that while we should control the policy of how the money is spent in preventing disease, we should not disturb the curriculum of the schools. We should consider the authorities who are controlling the schools, and allow them to run their schools, but go to them and say: "Gentlemen, we are willing to work in the hours you state and to make our visits at the times you state, but as to how we shall attempt to prevent disease in this way, that is the policy of the health department and not the policy of the board of education."

The Acting Chairman. It has seemed to me that we should first determine the limitations of our field in this respect and recognize the peculiar duties of educational authorities; that is, that they shall determine the amount of time that shall be devoted to teaching hygiene and how it shall be taught to children. That is their business; but it does seem to me also as though the health authorities should advise with them as to the facts to be taught and the limitation of facts, and that the health authorities should be depended on to protect the health of the child during its period of compulsory occupation.

The next subject on the program is that of rural sanitation, and I shall ask Dr. Rankin to open the discussion.

RURAL SANITATION.

Dr. Rankin. Mr. Chairman and gentlemen, the subject of rural sanitation is important for two reasons. One is its size. Over 53 per cent of the people of the United States live under rural government. Over 99 per cent of the area of the United States comes within the rural or county government. In certain sections of the country—for example, in the South—the local government, the government closest to the people and through which they have

to operate and learn self-control in the case of about 80 per cent of the people, is the county government. In my own State 90 per cent of the people live under it. Rural sanitation is important, then, on account of the size of the problem.

The second reason why it is important is on account of the state of development of rural sanitation. There are four governments in the country—the Federal, the State, the town or city government, and the rural or county government. You go to the Federal Government and the State governments and the urban governments, and you find fairly definite plans for dealing with sanitary problems. You go to the fourth government, the rural or county government, and everything is chaos. There are no plans; but on the other hand, there is an enormously and rapidly developing interest on the part of the people themselves in rural health government. They are demanding that their counties shall do something, and the counties have to respond. They are going to do something, and they are adopting all kinds of plans of work.

The point I want to make, gentlemen, is this: That after these counties in five or six years have adopted all kinds of plans for county health work, you are not going to get them to change; or, if you get them to change then, you must tear down a system and build it up again from the ground. So that, if we are going to direct and shape the development of the rural government in health work, this important and near government to the people, we have got to do it right now in the next two or three years.

Those are two points I want to make with regard to the importance of rural sanitation—the size of the problem and the present state of its development. If you are going to train a child you must do so while it is young. If you let that child go until it is 13 or 14 years old, you will not do much for it.

Now, how are you going to direct or develop the rural or county sanitary administration? There are several ways proposed. In the first place, it is proposed by a number of States that the State general assemblies or State legislatures shall pass an act requiring every one of those counties to have a whole-time county health officer; or, if not all the counties, that certain combinations of counties shall have a whole-time county health officer.

What are going to be his functions? Why, the State board of health will determine that. In other words, we will take a division of the local government and centralize it. We will let the local government put up the money, and the central government will direct the work. I think that where that can be done it is probably the very best thing that can be done. I just want to say, however, to those who are contemplating doing that thing—passing a whole-time county health officer law—that if they will take a piece of paper and

try to put down what that whole-time county health officer is going to do and how he is going to do it, they will find that job about tenfold more difficult than the job of getting a whole-time man.

According to natural law, function always precedes structure. We have not been following that general scheme in advocating this whole-time health-officer proposition. I have not. I have gone to the counties and said: "Let us have a whole-time man. This is one of the most important problems we have. Let us put in a man, with his entire time, to take care of it." They put that man there, and for the last three to six years he has been trying to find out how to take care of the job.

What are going to be the methods of the whole-time county health officer? If you will answer that question and send me the answer, you certainly will confer a great benefit and favor on my State. It is the most difficult problem I have ever confronted—trying to define the functions of the whole-time county health officer and the method by which those functions shall be carried out. That is a thing that ought to be considered by all the States that are contemplating passing a wholesale law for whole-time county health officers.

The foregoing is one way to get a whole-time health officer and one way to direct his work. Make it a State matter instead of a local matter. The other way, which my State and other States have followed and will have to follow, is to make the whole thing a matter of self-government. Go to the county instead of the general assembly and prove to the people of that county in various ways that men have of proving a public proposition—through newspapers, speeches, bulletins, letters, etc.—that they need a whole-time man and that they ought to invest $3,000 or $4,000 in getting a whole-time man. That method has the advantage over the State method in one particular. You must educate public sentiment; you must line up the majority of the people of the county behind it before you can get it: whereas in the State general assembly a whole lot of counties may not want it, and they have to take it anyway. You might consider that in passing.

Now as to the direction of the whole-time man. There we are dealing with the matter on a principle of government more fundamental than sanitary administration. We are dealing with the most fundamental principle of government in this country—the principle of democracy itself. You and I may or may not believe in a democratic form of government, but that is not a matter for us to discuss here. We have a democratic government, we are going to have a democratic government, and we have got to shape our health policies in conformity with the principle of democracy, which is fundamentally local self-government. And I believe in it, too. I believe

that it is the form of government that Christ himself taught. The government should be brought just as close to the individual as possible. In being taught self-government, the individual should learn self-control, the highest object of attainment.

That means that in the development of rural sanitation we must recognize the rights of local government, ignorant as it may be, to have the final say in what the health officer is going to do. "But," you say, "it will cost a lot of lives. They are inefficient; they are not so well trained as the State board of health, as a body of experts." That is so. But, my friends, if it costs a lot of lives for them to learn the art of self-government in health matters, then it will cost a lot of knowledge for them not to learn it; and you have got to choose between human life and experience and knowledge. And I do not know but what knowledge, experience, is the more important. Human life, as Dr. Hurty has said, is not the most valuable thing, after all.

Now, I believe there is a way of planning and of making efficient this rural or local government without trampling upon the principle of local self-government. I believe there are two ways in which that can be done. One way (and that is where the relation of the States to the Federal service comes in) is for the Federal Government and the States to work out together a model plan of county or rural health work. As it is, the United States Public Health Service is to send a man to a North Carolina county, after he has gone all over this country to study rural health work, to devise and put into execution a model plan of county health work. When that is done the Public Health Service can say: "This is what we stand for; this is our standard and model plan of county health work; and wherever we find a county health officer carrying out this plan, we will indorse his work." Then suppose the State government comes in and says, "That is our plan, too," so that down there in my State, or in your State, there will be a model or standard plan of county health work indorsed by the Federal Government and by the State government. Then we could say to any of the whole-time health officers: "If you carry out this plan here, and you get into trouble with politicians of that county or anybody else, we stand squarely behind you."

The plan will embrace the idea of reports, comparisons, and checks, so that when we publish every once in a while, in the publications of this office, that this county ranks 90, this one 80, and this one 100, we will be placing a premium on the man who is doing good work and make it worth his while.

There is nothing in the creation of a model plan of county health work—a plan indorsed by the Federal Government and the State government and adopted by the local government—that infringes upon the principle of local self-government. It is voluntary on the

part of the county to adopt it. That is one method for developing a system of rural health government or rural sanitation, and right there is where this Government, the Federal Health Service, and the States may cooperate with mutual advantage. I believe it is one of the functions of the Federal Government—the Public Health Service—to do administrative research work of this character. It is just as much its business to work out these problems of administrative research as it is to do scientific research. I do not ask the Service to come to North Carolina to operate a model plan of county health work, but to help devise it. I ought to be able to come here and say: "What kind of research work have you done on this administrative principle? What results have you obtained? What conclusions have you arrived at?"

There is another method of dealing with this principle of rural sanitation without ignoring the principle of self-government, and that is what we have been working on in my State under what we have called the unit system of county health work. We take the whole county health problem and divide it into several independent smaller problems. We say: "Here is your typhoid problem. That is independent of your tuberculosis problem, of your ophthalmia neonatorum problem, of your school hygiene problem; all of these smaller problems are independent of each other. One of the best ways in which we can handle the typhoid problem is to give your county as complete a vaccination as possible." So we work out all of the details of a plan of vaccination. We lay that before the county commissioners and say: "We will do that for you for $400. We will put in five weeks' work and vaccinate your people for 10 cents apiece, or we will do the whole work for $400." There is no violation of the principle of self-government in that case.

As an illustration, we carried out that plan in 12 North Carolina counties last year and vaccinated 52,000 people, an average of 4,300 per county, at an expense of about $500 per county. We vaccinate them this year for $400 per county, employing our own official. In other words, we simply increase the appropriation that the general assembly has made to us by going to the county and getting them to put up some more for special county work.

Take the work which Dr. Hurty has just mentioned. We are attempting to make a unit of county health work out of degenerative diseases, and we are working now on a plan for dealing with them. Briefly it is this: We are going to take a young man, a graduate of an A-1 college who has had two or three years in one of the best hospitals in the country; who is, as compared with the physicians of the county, a fine diagnostician and modern in his ideas as to the practice of medicine. We are going before the medical society of ——— County. We will say: "Here, gentlemen, we want you to

indorse this piece of work, and we want you to help us get an appropriation of $500 from your county commissioners for it. This man here is going to spend the first week in this county, lecturing in from 6 to 10 places in the more important towns, telling the people about the importance of periodic medical examinations after 30." Instead of taking the common defects of the children, or a group of diseases such as adenoids, eye, ear, and throat troubles, we are going to create a list of diseases, 6 to 10, that are common to the ages between 30 and 60, such as arteriosclerosis, tuberculosis, and Bright's disease. That is why we say examinations of those over 30 instead of those over 40.

During the lecture tour of this man there will be a good deal of newspaper stuff running, a lot of circular letters, and a lot of placards posted over the county. After getting the population thoroughly interested in the idea of a periodic medical examination, the man will for two months have offices at the county seat, where he can be seen by anybody over the age of 30 for a periodic examination. It will not be a complete physical examination, any more than the school child is given a complete physical examination, but it will be sufficient to detect the common diseases of this period of life, and each person examined will be told what he has and how he can guard against it. Our man will not treat any diseases. He will refer them all to their family physicians. He is going to line up the family doctors with him, because it is to their interest to have these examinations made.

The Federal Children's Bureau is in North Carolina at present trying to work out a unit on infant hygiene that can be applied according to the method used in rural sanitation.

To conclude, these are the two methods which we are trying to follow: The creation of a standard plan for county health officers to adopt, and the unit system of going to the county and making a definite contract with them for doing the work and letting them pay for it.

Dr. Trask. Mr. Chairman, it seems to me that the point raised as to the logical application of democratic government is an exceedingly important one in connection with municipal health work, State health work, and Federal health work, and is especially applicable, as brought out. to the question of rural sanitation. I have had difficulty in deciding in my own mind what is a logical application of democratic government. Does it consist in letting each State make its own laws and determine what it shall do in a public health way (limiting our argument for the present merely to public health matters), or does it go one step further and say that in each State each county shall have autonomy in public health matters? Or does

it go to each incorporated town and township in each county? And if it goes there, why not to each household; and if to each household, why not to each individual?

In a thing like public health administration, assuming an intelligent, honest, public service, that form of government will be most effective which covers the largest area and includes the greatest number of people: for the control of disease and the preservation of health can seldom be limited to political subdivisions. In this country each State is autonomous as relates to its own public health matters. But I am not sure that efficiency and the better interests of the people do not suffer when there is a lack of definite correlation of the public health agencies within a State under a strong State health department. It is difficult, to be sure; it takes men and it takes money; it takes thought and attention for a State health department or those at the head of the State health department, to grasp a great, big thing like a system of public health administration for a whole State. It would be far easier to say that each county should take care of itself, and when it came to the county to say that each township and town should take care of itself, and when it came to the city, sometimes the path of least resistance would be to say, "Tell the householders what they should do through the newspapers, by lectures, and by exhibits. Educate them in that way. That is all that can be done."

I think that this is an important question, and that it is exceedingly pertinent to this conference. It may not be entirely pertinent to the subject under consideration, but it was brought up by the previous speaker.

In regard to the question of degenerative diseases, while the physical examination of persons of 30 years of age and older is a good thing as a side issue and will be beneficial, it seems to me that a public health examination of each child means far more. The grown-up is lost. He is what he is and never will be anything else. But if you can protect and teach the child, you will in future have an adult who will be a distinct asset to the community. When these children grow up, we will have a generation that will relieve us of much of the worry of public health administration, because we will have an intelligent generation of people who know what public health is and how it should be protected, and all we will have to do is to carry out their instructions and they will see that we do what we should for public health. They will see that there is proper health protection.

Dr. Tuttle. Mr. Chairman, it seems to me that real rural sanitation (and in rural sanitation I include the small towns, anything less than 2,500), is to a very large extent the foundation of our public health work to-day. In Washington last year we studied

our typhoid returns very carefully, and found that 94 per cent of our cases of typhoid fever, though a good many of them were reported from cities, were in fact of country origin.

How are we going to get at this country work? As to Dr. Rankin's idea that the Public Health Service shall lay out some rule for whole-time health officers, I am wondering how a system which works well for North Carolina, South Carolina, Virginia, or Georgia would work out in Washington or Montana. We have a system something like that, and it does not work very well. But it seemed to me that Dr. Rankin struck the keynote of our failure in rural sanitation. We are going to employ an A–1 man, and send him to the principal cities in our counties, and he is going to talk in the principal cities.

What does the farmer know about a health officer? I have gone out and sat on their front porches and talked to them, and what do they say? They say: "What is the health officer good for? He comes out here and tells me I have got to clean up my place or I can't sell stuff in the city." He does not know anything about a health officer who comes out there and tells him, "Mr. Farmer, your boy hasn't been doing very well for the last year, has he?" "No, he hasn't; but how can I help it?" Tell him how he can help it in a practical way. If we can do rural sanitation work, we will stop having typhoid fever in the city, and that is where we have got to approach the individual man and show him it is something of interest for him and not for the health authorities.

Dr. Bracken. Mr. Chairman, I have been very much interested in the discussion. Dr. Rankin has pointed out the virtues of democratic government, and Dr. Trask has given us the other extreme; but I think these two gentlemen really agree. I think Dr. Rankin has made some excellent suggestions. If he can persuade the county commissioners to assume this responsibility I congratulate him. I am coming down to North Carolina some time to see how he does it, then maybe I can go back to Minnesota and do it. I hope so.

Dr. Kelley. Mr. Chairman, I would like to ask Dr. Rankin two questions. First, I have been interested in his plan of carrying out this unit administration ever since he first broached it about two years ago. It has all been most instructive and certainly must have produced a very considerable degree of good. I was wondering if he has any data in North Carolina, or if any of the other States or the Service have, on a similar type of campaign which has been very heavily financed both by the States and by private organization—the hookworm campaign. As near as I can determine, it has been carried on for quite a number of years along these lines of a maximum of effort to arouse the attention of the people to the existence of the problem, plus the offer of immediate assistance to

eradicate the condition, plus fundamental, simple sanitary engineering principles to remove the sources of future infection. Those three fundamental principles, I take it from what we have heard of the hookworm campaign, have been carried out very consistently, we will say, in North Carolina, for six or seven years. Am I right?

Dr. RANKIN. Yes; six years.

Dr. KELLEY. Now, would you judge that you had got 20, 30, 40, or 60 per cent efficiency result in North Carolina from the standpoint of removing the hookworm menace; and if not, why not?

The other question is similar. Dr. Rankin's scheme aims at getting an expert interne to go into a given county, arouse great popular interest in the wear-and-tear diseases, urge the people to come in and consult with him, and then refer them back to the family physician. Would there be a comeback that would adversely affect the cause of public health a great deal more than the agitation of the cause would promote public health? It seems to me there might be this interpretation: Some rude and unfeeling element in the community would say, "Here we have a spectacle of the agent of the medical trust hiring a medical booster, paying for it out of the public funds, to drive our people back to the doctors to get more money and more business for them." I wonder how they get around that point.

Dr. RANKIN. I can not give Dr. Kelley any definite answer to his first question. I think the Rockefeller work has done a great deal of good, and a great many people are now interested in sanitation who would not have been had it not been for the campaign; but as to saying just what the effect has been, I myself feel that there has not been enough check-up work of that kind done by the commission, taking counties and comparing conditions before and after. I can not give anything definite. I would rather let the commission answer that question.

The second question which Dr. Kelley raised, the effect of referring cases found by a public official to the medical profession, is a thing that I have considered. It is a thing to be thought of by any one undertaking work of that kind. There are advantages and disadvantages. For example, in a number of States the medical profession are rather critical toward the public-health officials for giving them so little attention and disregarding them altogether in health work. Now, we can certainly make it plain that this piece of work is of public benefit, and I do not think we need hesitate to say that it is also of a business advantage to the profession to have it done, as well as in accord with the humanitarian motives of the profession. It remains to see just how the public will take that. I expect in some counties that point would be made and in other counties it would not be made.

Dr. LUMSDEN. Mr. Chairman, it seems to me that in the discussion of this very important subject of rural sanitation we have had this morning a difference of expression of opinion rather than a difference of opinion. We all agree that this is a big problem. There is no doubt that it is a problem which reaches the individual in the home. It reaches the father, the mother, and the children directly and individually and collectively. It reaches the township, it reaches the county, it reaches the State, and it radiates throughout the Nation. It is one of our big local problems; it is also one of our big interstate, or national, problems. Therefore, it seems to me, in attacking this problem, all of our governmental forces may combine to advantage. The big question before us is how we can cooperate to the best advantage.

In every field of work in which forces from the several political divisions of our Government have engaged, serious questions have arisen about where the rights of one governmental body should stop and where the rights of the other governmental bodies should begin. In the attempt to solve the problem of "State rights" we once had a terrible civil war and now, over 50 years since that war ended, that problem is still unsolved. Some of the principles involved in the War between the States have been under serious discussion in our Halls of Congress within the last few weeks in the course of the debate on the good-roads bill. The exact separation of functions of our National, State, and local governments is a tremendous question upon which the master minds of this country will probably never entirely agree. In the great field of health work upon which we are engaged it seems that we are having less trouble with our "twilight zones" than are those engaged in other fields of work. We are cooperating, and we are cooperating better and better every year; we are cooperating better because the people, the individual units in our social system, are supporting all of us better.

As Dr. Rankin tells us, in some States the State board of health and the county boards of supervisors are cooperating, and they are cooperating, not in saying together, "It is a good thing," but in putting up the absolute essential to all public-health progress—money. The county is putting up some and the State is putting up some, and they are working together. We are having cooperation to some extent between the National Government and the States, and in some instances the county, the State, and the National Governments are all working together on a scheme of rural sanitation. I find that there is cooperation with what we may call an international body—the Rockefeller Foundation. I find that counties are cooperating with the Rockefeller Foundation in work on rural sanitation. I find that some State boards of health have secured from their appropriation committees in their legislatures appropriations for

work in rural sanitation in cooperation with the Rockefeller Foundation. But I do not know yet of a single State board of health—and, gentlemen, I wish this to be given your serious consideration—I have not yet heard of a State board of health which has asked its legislature to appropriate any sum of money to cooperate with the National Government in attacking this great problem of rural sanitation.

The Public Health Service is doing a little work in rural sanitation. We succeeded in obtaining the sum of $25,000 for "special studies of and demonstration work in rural sanitation" during the three months ending July 1, 1916. If there were 8 or 10 States in each of which the State board of health had available the sum of $2,000 or $3,000 to cooperate with the National Government in this work, we could do at least twice as much as we can do now. And the more we do as a national health service and the more you do as State boards of health the sooner we can expect to succeed in getting that which is absolutely essential to sanitary progress and which was emphasized so well by Dr. Tuttle—we will succeed in getting the individual citizen to see that the National and State Governments are doing something for the protection of his health and that of his family. Until we do that we are going to have serious difficulty in getting reasonably adequate appropriations.

The recent work on rural sanitation done by the Public Health Service in cooperation with State boards of health and with county boards of health has yielded highly encouraging results. We have completed the survey in nine different counties, and we are now engaged in work in four other counties in different States. In every one of those counties marked sanitary improvements were effected by the house-to-house survey. In the counties of which we have fairly complete records for previous years typhoid fever was reduced by over 75 per cent. Considering the amount of money expended for the purpose, the results in these counties, we think, demonstrate the feasibility of rapid progress in rural sanitation. We should work together to extend the scope of such demonstrations.

Some agreement among State boards of health as to methods to be advocated is highly important. At the present time some State boards of health are advocating one method and other boards are advocating a radically different method for correcting the same insanitary condition. If one force of health officers goes into a community and advocates one scheme and another force of health officers in a neighboring community advocates another scheme, the people are going to decide, and decide wisely, that we do not know very well what we are talking about; and with such marked difference of opinion in evidence I believe some of us do not know what we are talking about.

I think it is high time for us to make an earnest endeavor to reach an agreement about standards for carrying out the measures which are needed for fixing an insanitary well and for fixing an insanitary privy. And I make the motion, Mr. Chairman, that a standing committee on rural sanitation be appointed from this body to take up the important phases of this subject and to report from year to year on progress and on methods for improving insanitary conditions. I suggest also that such a committee might consider to advantage a scheme for better cooperation between the State boards of health and the Public Health Service for real work on rural sanitation.

(The motion was seconded.)

Dr. GOLDBERGER. Mr. Chairman, I have been very much interested in the discussion of rural sanitation, and it struck me in listening to this discussion that it might be more helpful if we could have a definition of what rural sanitation is and what it comprises. I was especially impressed by the motion of Dr. Lumsden that we have a committee to look after problems of rural sanitation.

Now, we already have several committees, one of which is, I think, a pellagra committee. That very properly comes within the scope of rural sanitation. I do not want to contribute anything at all, except possibly to clear up a little irregularity in thinking. Let us define what we are talking about, and then perhaps we can take measures suited to carry out our objects.

Therefore, I should like to offer an amendment to Dr. Lumsden's motion to make it read "a committee whose duty it shall be to determine the limitations, the scope, and standard methods of excreta disposal in rural communities."

Dr. WOODWARD. Mr. Chairman, I move that the whole matter be referred to the committee on resolutions.

(The motion was seconded and carried.)

Dr. HAYNE. Mr. Chairman, when the discussion started out I thought I had a beautiful chance to come back at Dr. Rankin, but Dr. Trask came back at him so well that I feel that he has stolen my thunder entirely.

I do not believe in a democratic form of government. I do not believe the unintelligent individual that makes up our State or our county or our township government should decide upon the methods of sanitation in that community or town or State. Therefore, if we carry it to its logical conclusion, if we do not believe in the individual governing, if we do not believe in the township government, if we do not believe in the county government or the State government, then it brings it back to the fact that we do believe—and I do believe—in Federal Government.

Now, that sounds odd coming from South Carolina. But the difference between the fool and the wise man is that the fool and the

wise man may both make a mistake, but the wise man does not repeat it. Therefore, having been up against the problem in my State of individual self-government, I am compelled to believe that that kind of government is not the best kind of government for the best citizens of that State.

Along the line of Dr. Hurty's address, I, too, believe in the preservation of the life of a man like Robert Louis Stevenson. Although physically weak, although possibly not able to propagate a wonderfully physical specimen, yet that man might hand down that genius that burned in his brain and make this world a better place to live in. When we are talking about sanitation we are talking about health for individuals, for human beings, and not for hogs. It may be very well to have a large boar, a physically perfect boar, but is that boar going to make an intelligent razorback hog that can make his living in North Carolina? That well-bred, that fat hog, with all his ancestors behind him making toward a fat hog, is not going to be the hog that will survive when stress of circumstance comes upon him. It is the same way with the human being. You can pick out a young man who has never worshipped at the shrine of Bacchus or Venus or Vulcan; you may pick out a woman who has never felt the stress of passion, and they may bring a physically perfect child into the world; but will that child have any better mentality than the child of the ordinary man of the world. The clam may live a long time—scientists do not tell us how long the clam will live—but who wants to be a clam? And I believe firmly—my doctrine is strictly epicurean—that we should enjoy the pleasures that God has put in this world for us to enjoy.

Dr. Rankin. I recognize that this principle of the rights of the local government, on which the discussion has hinged, is the fundamental principle involved in this question of rural health work.

Just a word in regard to what Dr. Trask has said. He starts with the principle of government and analyzes the whole thing from above down. Well, you can start in the reverse direction and synthetize from below up, and you get a form of monarchical government. I do not believe there is any such thing as an absolute democracy or an absolute monarchy. But I do think, gentlemen (and that is one of the important things to be considered by meetings of this kind, and will be considered in a day or so by the conference of secretaries of state and provincial boards of health), that there are problems that are interstate, that are predominantly Federal; I do believe that there are other health problems which are predominantly intrastate; and I do believe that there are other health problems, just as there are educational problems, just as there are problems of law and order, and problems of all other phases of govern-

ment, that are predominantly local. I think some of the health problems are predominantly local. But there is a proper division of government into Federal, State, and county, and I think there is a place for the exercise of the individual responsibility of each one of these governments in the field of sanitation.

STANDARD METHODS OF COLLECTING PUBLIC-HEALTH INFORMATION.

The Acting Chairman. We will next take up the subject of standard methods of collecting public-health information. The question arises whether the adoption of uniform methods of accounting by the local, State, and Federal Governments is feasible, as we certainly think it is desirable. We have felt that it would be an advantage to be able to get statistics and public-health data from one State that would be comparable with those of another, and especially financial data. I will ask Dr. McLaughlin to open the discussion of this subject.

Dr. A. J. McLaughlin. Mr. Chairman and gentlemen, the lack of standard methods and of uniformity in public-health information goes into every activity that we exercise as health officers. There is a lack of uniformity in everything. I am very glad there is a tendency to limit this discussion to the financial side, and certainly there is great need of some uniformity in methods of expressing the financial well-being or otherwise of our health departments.

In the first place, to get some uniformity for purposes of comparison in the amount of money spent, and how it is spent, between the States, it would be necessary to have some uniformity of organization; and while it would not be possible, nor is it desirable to have complete uniformity, there are certain fundamental problems of organization that will come.

First, the division of the department's activity into divisions. What divisions should we have? Some departments have divisions which are not heard of in other States. It is pretty difficult to get a comparable organization. But we can agree on certain fundamentals. Of course we must have an administrative division. Possibly we can all agree that there should be a division of communicable diseases. I think we can all agree that there should be a division of sanitary engineering. And then we begin to get into trouble. For instance, some States have a division of foods and drugs, and in other States the food and drugs are handled by some other division of the State government. Some States have an industrial hygiene division or hope to have in the health department, and in other States this is handled by a separate branch of the State government. So to get organization that is comparable is a difficult mat-

ter. But that does not mean that we should not attempt to get our organization somewhere on the same plane.

The idea of having the organization comparable, of course, is carried farther by having our appropriations made under somewhat the same headings, so that we can get a comparison between the States as to how the money is spent, and this is also a very difficult matter. In Massachusetts it has been the custom to make 15 or 16 or 18 different appropriations under specific names, but we have simplified that somewhat. Last year I attempted to get the appropriations made under four heads, and I failed. The attorney general decided it could not legally be done, because it never had been done in Massachusetts; and anything that never has been done in Massachusetts has a mighty poor chance of ever being done.

So the best we could do was to make a compromise. We did get the appropriations into about 14 heads, but we had them made in such a way that they could be grouped into six very easily. For instance, under general administration—they would not give it to me under that name, but they gave the salary of the commissioner, $4,000 for the annual report, and then gave me $18,000 for the general administrative expenses, making a total of $29,000. The sanitary engineering appropriation is one lump sum of $56,000. The food and drugs is in three heads, but it is grouped so that we can use it as one appropriation of $32,000. I got $14,300 for a division of hygiene, a new appropriation which in our department combines the subdivisions of child hygiene, industrial hygiene, and health instruction.

The communicable diseases division has four appropriations—one for the director's salary, one for an epidemiologist, $38,000 for the district health officers, and $5,700 for the diagnostic laboratory; but, of course, we can put it together and consider it as one appropriation for communicable diseases. For the biological laboratories—that is, the manufacture and distribution of antitoxin and vaccine, institution of the Wassermann test, and the examination of glanders and rabies work of the Bureau of Animal Industry—we get a total of $29,000.

So in our State we have appropriations that I think can be compared with those of other States in a fairly definite way. Of course, if you read the report of the expenditures of the State of Massachusetts you will see that there is $600,000 charged up to public health, and when you analyze it you find that most of that was paid as reimbursement to farmers for cattle that were slaughtered in the foot-and-mouth epidemic. If you dig it out you can find what was spent by the health department, but it is a tedious process. We can tell you in the department, because we know what we get.

Now, carried a little further, suppose we had comparable appropriations in the different States; then have we comparable activities? For instance, we have a man who is paid in the communicable disease division as a district health officer; but he is giving part of his time in the division of hygiene as instructor, giving lectures, etc. We are trying to get at this thing. We have a time sheet which shows just how much time each district health officer gives to the various activities of the department—so much to work on local boards, so much to lecturing for the hygiene division, so much travel, so much under communicable diseases.

In regard to how the estimate should be made, I believe in a segregated budget, but I do not want to see it enacted into law in that form. We make our estimate by items, just as in a budget. It goes to the auditor in that way, and he says: "This is a gentlemen's agreement, and if you make it in that way we will put it in the lump sum; but we want to be shown that your estimates are not away overshooting the mark." That works out very nicely. Our estimates are published, the statements of the expenses of the year before, and the pay roll added, with the increases frankly stated. Then the auditor makes recommendation to the ways and means committee, and the money is voted in a lump sum, not by items. I think it is a pretty good system.

I also believe appropriations should be specific, and that amounts appropriated for a certain purpose should not be expended for anything else. Formerly, in Massachusetts, there was a general appropriation of $42,000 or $43,000, and all sorts of expenses were being paid out of that general appropriation. I cut the general appropriation to a salary roll of the administrative officers and the expenses of the administrative officers in running the department in general. I make each division pay for its own printing: each division must pay its own incidental expenses. I found in the general fund when I went there $5,000 for the Wassermann laboratory, which had never been installed; $4,000 for an epidemiologist who had never been hired; and it was deemed no impropriety to turn it into the general fund. The auditor agreed. Now in the general fund we have what belongs there and nothing more.

I might go on indefinitely in this manner, because I am very much interested in matters of administration, and a comparison between the States is the most interesting thing in the world, if we can only get some common ground of comparison.

Mr. Chairman, I thank you.

Dr. Swarts. Mr. Chairman, I would like to offer a resolution that a committee be appointed by this conference to formulate a scheme

whereby these figures can be obtained and distributed to various boards of health. We are all familiar with the questionnaire which has come in daily to us, requiring the work of one clerk to answer the same questions he answered the day before to some other State board or some other organization, and it is one of the greatest annoyances, I think, of the department to know how to divide that up. If we had a uniform system, and the questionnaire could be referred right over to the Federal Health Department or the committee of this conference, it would save us a great deal of trouble.

(The motion was seconded.)

The Acting Chairman. It is moved and seconded that there shall be a committee appointed to suggest a scheme to get comparable reports from State health officers in matters of accounting. If there is no objection, this matter will be referred to the resolutions committee for proper drafting.

(Resolutions by Drs. Bracken and Warren, on school hygiene and sickness insurance, respectively, were referred to the committee on resolutions.)

PELLAGRA.

Dr. Hayne. Mr. Chairman, I made a minority report on pellagra, as chairman of that committee, on the advance that had been made in the last year:[1] and I think before we adjourn, if there are any other members of that committee present—none were present at the time of my report—that this conference would like to hear what work has been done, and also have some resolution introduced and debated in regard to what we can agree upon as to the prevention and cure of this disease. If you can agree on the cause of it, that is so much the better; but you certainly ought to have some resolution as to the prevention and the cure of the disease. A great many of us in the South find this disease probably the greatest factor in our death rate of any disease that we have, except tuberculosis and diseases of children. Certainly we ought to take some action in regard to the work that has been done, and I would like to hear from some of the other members of that committee, if any of them are present.

The Acting Chairman. I should like to ask Dr. Hayne or Dr. Goldberger whether they would feel free to offer a resolution at this time, or submit it to the members of the resolutions committee. I think there will be time enough at the afternoon meeting, if those members of the committee who are here will confer together and present a resolution, or whatever action they may deem desirable, to the chairman of the resolutions committee. If there is no objec-

[1] See p. 27.

tion, that action will be taken. Dr. Hayne is chairman and Dr. Goldberger is present. Unfortunately, the other member of the committee is not here.

ESTABLISHMENT OF AN "AREA OF KNOWN DISEASE PREVALENCE."

The next topic we will discuss is "the establishment of an area of known disease prevalence." The question is raised whether it is practicable and desirable at the present time; and if so, what diseases should be reported and what standard required for admission. Some phases of this subject have already been discussed; but Dr. Fulton, of Maryland, is here, and I shall ask him to address us.

Dr. FULTON. Mr. Chairman, it would be very unkind at this hour to keep you here for the presentation in full of the subject that I have been studying for a couple of years, with a view to determining whether it is feasible or not to form a registration area for morbidity. I am going to say very little about it this morning, but I am going to ask each of you to take one of these summaries. One concerns the four years' experience for the registration States, and the other for American registration cities in a notification of four diseases—measles, scarlet fever, diphtheria and typhoid—the diseases which occur indifferently with respect to temperature, latitude, and questions of that sort.

You will find that during these years registration has regularly improved from year to year. At this moment cities can record their situations a little bit better than the States in which they are situated. There are exceptions; there are States which are better able to do this than cities.

I have been asked whether these figures that are found at the end of the column with respect to both cities and States represent the true fatality. That raises the other question as to what is the test of the completeness of registration; and I think we will have to agree that that is the only ratio that we can use as the test of the proportionate amount of sickness, as compared with deaths: whether, for instance, 1.74 is proper for measles, 3.79 for scarlet fever, 9.90 for diphtheria, 16.70 for typhoid fever, and 5.5 for all of those four diseases combined. The answer would be "No; all of those figures are too high." It is necessary, however, to make liberal terms if we are going to start registration of all sorts; and do not forget that when we get to the registration of morbidity we are going to realize, as we do not now, that there are just as many failures in the registration of sickness as there are in the tabulation of deaths. About those we are not now informed, but we shall be informed when we really go systematically into the study of current morbidity.

Morbidity and mortality of measles, scarlet fever, diphtheria, and typhoid in registration States, with fatality rates, 1912, 1913, 1914, 1915.

	1912			1913			1914			1915			Total.		
	Cases.	Deaths.	Fatality.	Cases.	Deaths.	Fatality.	Cases.	Deaths.	Fatality.	Cases.	Deaths.	Fatality.	Cases.	Deaths.	Fatality.
Measles	161,725	3,214	1.99	198,676	3,618	1.71	127,537	2,169	1.69	138,648	1,900	1.36	626,586	10,901	1.74
Scarlet fever	63,725	2,930	4.51	65,922	2,983	4.53	63,737	2,312	3.63	64,724	1,579	2.44	258,108	9,804	3.79
Diphtheria	68,714	7,755	11.28	72,443	6,876	9.49	68,872	7,551	10.96	75,837	5,985	7.89	285,866	28,167	9.90
Typhoid fever	32,797	6,606	20.14	40,455	6,548	16.18	34,004	5,663	16.65	31,649	4,598	14.53	138,905	23,415	16.70
Total	326,961	20,505	6.27	377,496	20,025	5.30	294,150	17,695	6.01	310,858	14,062	4.52	1,309,465	72,287	5.50

Prevalence of measles, scarlatina, diphtheria, and typhoid in certain American cities, with fatality rates, 1912, 1913, 1914, 1915.

	1912			1913			1914			1915			Total.		
	Cases.	Deaths.	Fatality.	Cases.	Deaths.	Fatality.	Cases.	Deaths.	Fatality.	Cases.	Deaths.	Fatality.	Cases.	Deaths.	Fatality.
Measles	91,643	1,507	1.64	144,910	2,333	1.61	86,416	1,344	1.55	127,600	1,669	1.30	450,569	6,853	1.52
Scarlet fever	40,309	1,888	4.68	45,841	2,547	5.55	43,604	1,857	4.26	33,855	920	2.72	163,609	7,212	4.40
Diphtheria	44,761	4,081	9.11	54,454	5,055	9.26	59,494	5,086	8.54	54,755	4,424	8.08	213,464	18,646	8.73
Typhoid fever	14,013	2,073	14.78	15,535	2,436	15.68	14,031	2,323	16.55	13,329	1,937	14.53	56,908	8,769	15.40
Total	190,726	9,549	5.00	260,740	12,371	4.74	203,545	10,610	5.21	229,539	8,950	3.89	884,550	41,480	4.69

There are great differences between cities and between States. At this moment the best registration State in the United States is Utah. That is a surprising thing. We have known it for two or three years. One of the youngest States, a State just in the registration area for deaths for a short time, it is the best registration State for sickness on the whole, although not with respect to these four diseases. The District of Columbia, which is counted as a State in these registration divisions, is really an urban population, yet it sets us a first-rate standard. The most consistent performer in all of our federation of States is the District of Columbia. And similarly comparing cities, the District of Columbia is perhaps the most consistent and safest criterion that we could adopt at this time. But you could not establish a registration area on such criteria as the District of Columbia would furnish. The District of Columbia runs a mortality for measles, straight along, well under 1 per cent. Now, if we put up thirty-six one-hundredths of 1 per cent as a criterion, there is no State, no city, that would be at all eligible for the registration area.

You find the same thing with respect to scarlet fever, which is a more variable disease than measles is with respect to its fatality. More irregularities occur with respect to scarlet fever than with respect to any of the other diseases. Three and seventy-nine hundredths is a very liberal criterion. Any State which is registering scarlet fever so well as that has still a good deal to learn about the registration of scarlet fever, but that is a low standard which practically all of the States registering deaths can reach.

Now, with respect to diphtheria. The fatality of diphtheria does not depend on the nature of the disease in this sense quite so much as it does on the use of antitoxin. So you find that the States vary very much with respect to the fatality of diphtheria. Practically all registering deaths well can comply with a requirement of 9.9.

With respect to typhoid fever, for the States in general, the 16.7 is a very high fatality. The right fatality is certainly under 10, and Dr. Bracken thinks it may go down to 5 or 4. I believe the medical profession in his State of Minnesota would consent to a statement that there were more than 20 cases reportable for every death that occurs, and nearly all the States could get into a registration area under this very easy criterion of 16.7.

With respect to a method of scoring, I have thought it worth while to combine all of these diseases. There is one State particularly that does not register measles—the State of New Jersey. It registers other diseases very well. I presume in general it is merely a matter of practice as to what diseases really are reportable under the law. We have taken these four because, year in and year out, they are not particularly variable with respect to fatality, and they are the safest criteria. Tuberculosis has been suggested, and other sugges-

tions have been made; but obviously we will have to take the commonest and simplest criteria at the outset. If we started a registration area on this plan we should have to lower the standards a great deal, because our practice would grow in a few years in a manner which would make our criteria look a little ridiculous. I have scored the various States in this way: How many would be admitted on the measles score alone, 1.74? How many would get in on the scarlet fever criterion alone, 3.79? How many on diphtheria, 9.9? How many on the typhoid criterion, 16.7? How many on the criteria for the whole four, 5.5? That would be the fairest way, in my own opinion, to see what States would form that group for a beginning.

I would like to offer a resolution to the general effect that it is now feasible and practicable to create a registration area for morbidity, and that this conference ask the Surgeon General to inquire into the feasibility of making a registration area for morbidity, and, if found feasible and practicable (of course we can only answer for the States' end of it, and the Surgeon General of the Public Health Service must necessarily find out whether it is a practicable thing from his viewpoint), that he formulate the registration area and the criteria for admissibility thereto.

Dr. Bracken. I would like to ask, Mr. Chairman, if it is Dr. Fulton's idea that a registration group should be formulated on what is reported, or that a trial year will be taken to determine which States could qualify for such a grouping. The latter might be a great incentive for States which are not now in position to qualify, and it would stimulate reporting the morbidity returns.

There is one point worth noting if such a registration area is created, viz, that a reduction in fatality would not be evidence of an improvement in conditions, and that an increase in morbidity would not be evidence of an increase in disease.

I hope we may get down to a working basis on morbidity records for the next year.

Dr. Fulton. I might say that this matter began to be considered two years ago, and it was up last year and was discussed pretty fully, and I am inclined to think that it would be a perfectly sound basis, if the Public Health Bureau finds no difficulty on its part, to make a registration area for sickness this year, on these criteria, and it will be a very much larger registration area for sickness than we had for deaths a few years ago.

So I take it it will be an experimental year in any case, but I would like the experimental year to occur this year, if it meets with the approval of the Surgeon General.

The Acting Chairman. Are there any other remarks on this subject? If there is no objection, Dr. Fulton's resolution will be referred to the resolutions committee.

Dr. RANKIN. Mr. Chairman, I should like to call the attention of the members to the conference of secretaries of state and provincial boards of health and invite them to attend this conference, which begins at 10 o'clock tomorrow morning at the New Willard Hotel.

The ACTING CHAIRMAN. If there are no further matters of business to come to the attention of the conference just at this time, we will recess to meet at the Hygienic Laboratory promptly at 2 o'clock, and the final session of the conference will be held in the library of the laboratory immediately after the demonstrations.

Afternoon Session, May 15, 1916.

LABORATORY ACTIVITIES.

At 2 o'clock p. m. the delegates met at the Hygienic Laboratory of the United States Public Health Service, at Twenty-fifth and E Streets, Washington, D. C., for a survey of the operations of the laboratory.

REPORT OF COMMITTEE ON RESOLUTIONS.

(The conference reassembled at 4:20 p. m. in the library of the Hygienic Laboratory.)

The ACTING CHAIRMAN (Dr. KERR). Is the resolutions committee ready to report?

Dr. SAWYER. Mr. Chairman, these resolutions have been handed in and passed on by the committee, and I now lay them before you.

HEALTH INSURANCE.

Whereas, in the opinion of the conference, it will be possible through health insurance, operated under governmental systems, not only to improve the economic status, efficiency, and health of individuals through better treatment of the sick, but also to make disease prevention by communities, States, and the Nation vastly more efficient: Therefore, be it

Resolved, That the members of this conference urge upon those who are planning legislation on this subject to provide for effective and close cooperation between the officials in charge of the administration of health insurance and the local, State, and National public health officials; and be it further

Resolved, That we indorse the principles of health insurance operated under governmental systems.

(Resolution adopted.)

INTRASTATE QUARANTINE REGULATIONS.

Resolved, That the conference recommends the appointment of a committee on intrastate quarantine regulations to consider the regulations of the various States and to report to the conference at the next annual meeting on methods of handling communicable diseases.

(Adoption moved by Dr. Tuttle and seconded.)

The Acting Chairman. In putting the motion I would say that, of course it is understood that this conference, so far as the Public Health Service is concerned, would not wish to dictate what should be done within a State, and it is only for the purpose of harmonizing the regulations that have already been issued by the Secretary of the Treasury with those of the several States that the question was brought before the conference.

(The resolution was adopted.)

ESTABLISHMENT OF AN "AREA OF KNOWN DISEASE PREVALENCE."

Resolved, That this conference believes it is now feasible to create a registration area of known disease prevalence, and recommends that the Surgeon General inquire into its practicability from the standpoint of the Public Health Service and determine the standard for admission of States and cities thereto.

(Resolution adopted.)

STANDARD METHODS OF COLLECTING PUBLIC HEALTH INFORMATION.

Dr. Sawyer:

Resolved, That the conference recommends the appointment of a committee to formulate standard methods of accounting for State boards of health.

(Adoption moved by Dr. Bracken and seconded.)

Dr. Kelley. Mr. Chairman, I move that we amend that to read "method for accountancy." I think "method of accounting for State boards of health" is beyond some people.

Dr. Woodward. Mr. Chairman, do we understand that that includes accounting for money expenditures and also of results obtained so that the two can be correlated?

Dr. Rucker. That was the idea.

The Acting Chairman. If I may state my own views, I should like to see it include both.

Dr. Sawyer. Mr. Chairman, would this change in the wording improve it:

Resolved, That the conference recommends the appointment of a committee to formulate standard methods of accounting for disbursements and results for State boards of health.

Dr. Fulton. It seems to me that the best verbiage we could use would probably be that in the question itself, as printed on the program this morning, for that was clear and was inclusive.

The Acting Chairman. It is understood that this committee would be a standing committee, and perhaps its scope could be larger on that account.

Dr. Woodward. The term "cost accounting" would probably cover it. That is the term that would be used commercially, I think.

Dr. SAWYER. If we said "cost accounting and determination of results," would that be more clear?

Dr. WOODWARD. With respect to the large number of the operations of any health authority, although you may not be able to determine what the results are, yet you can estimate the cost of the undertaking.

Mr. HANSEN. Mr. Chairman, I would like to suggest that an amendment be adopted to the effect that this committee is to consider the organization, accounting, and budget making of State health departments.

(The motion was seconded.)

The ACTING CHAIRMAN. In effect, the resolution as amended is as follows:

Resolved, That the conference recommends the appointment of a committee to formulate standard methods of recording public health data, with particular reference to cost accounting by State health agencies.

(The amendment and the resolution as amended were adopted.)

RURAL SANITATION.

Resolved, That the conference recommends the appointment of a committee on rural sanitation to report at the next annual conference on methods and standards for the improvement of the health of rural communities.

(The resolution was adopted.)

SCHOOL HYGIENE.

Dr. SAWYER. The next resolution:

Resolved, That it is the sense of this conference that the sanitation of schools and the protection of the health of school children should devolve on health authorities; be it further

Resolved, That the extent of the teaching of hygiene in schools and the methods to be adopted should be determined by educational authorities; and be it

Resolved, That the health and educational authorities should cooperate in these matters.

(Adoption moved by Dr. Tuttle and seconded.)

Dr. WOODWARD. It seems to me that we should hardly so readily surrender to the educational authorities the right to decide what will be taught concerning matters of health. I think that the least we could do with respect to that would be to say nothing. I believe that the teaching of health ought to be at least to the satisfaction of the health authorities. They ought to have the last say as to how it should be taught and what should be taught, if we are going to get harmony. I dislike very much to disturb the report of the committee, but otherwise I should be inclined to move that

so much of the report as relates to the teaching of health be omitted; that we at least remain silent on that subject.

Dr. BRACKEN. Mr. Chairman, as I helped to frame the resolution, I accept the suggestion of Dr. Woodward. I think he is quite right in his position.

Dr. SAWYER. Would the first clause alone be sufficient?

Dr. WOODWARD. I think you would have to provide that the health and educational authorities should cooperate in the matter of inspection of schools. It is simply impossible to establish an inspection of schools without the cooperation of the school authorities. You have got to depend on the teachers and school principals for certain work.

(Resolution as amended read:

Resolved, That it is the sense of this conference that the sanitation of schools and the protection of the health of school children should devolve on health authorities, and that to these ends they should have the cooperation of the proper educational authorities.)

(Resolution adopted.)

INCREASING EFFICIENCY OF CONFERENCES.

Dr. SAWYER:

Resolved, That it is the sense of the conference that in order that its deliberations in future may take wider counsel in State matters, that State departments or State boards of health might well hereafter include in the delegation from their States such local health authorities as may be deemed advisable, it being understood that in matters requiring a vote under the law each State is entitled to only one vote.

(Adoption moved by Dr. Rucker and seconded.)

Dr. RANKIN. Mr. Chairman, may I ask if that resolution has been approved by the resolutions committee?

Dr. SAWYER. It was approved by those of us who were here together just before the meeting was called. Dr. Rucker and I went over it.

Dr. LUMSDEN. Mr. Chairman, is it stated who shall deem it advisable or inadvisable as to what local health officer shall be invited?

Dr. SAWYER. It is not clearly stated.

Dr. LUMSDEN. Is that left with the State health officer or the executive officer of the State board of health?

Dr. SAWYER. That was our supposition.

Dr. JEPSON. The great difficulty about that is in the payment of the bills. In the case of local health authorities, who is going to do it?

Dr. RUCKER. Mr. Chairman, that portion of the resolutions committee which handled this matter has considered the subject in this wise: This body is constantly discussing matters which are of intense

value to municipalities and to county health organizations. At the present time such officers are not invited to be present at these conferences, nor do they have a legal right to attend. These men can throw light on these problems in a way that we can not. They look at the thing in a very different way from what the States do; they look at it in a different way from what the Federal Government does; and it would seem as though, if it were just understood that they would not be unwelcome at these conferences, it might be that the conference could avail itself of information secured in this way which it would not otherwise have. This resolution does not bind anybody to issue the invitations for them to come, or anybody to pay the expenses. It merely says, in effect, if a State wants to include in its delegation a municipal health officer or a county health officer, or a number of these gentlemen, that these men will be welcome when they come to the conference. It is merely an idea to get more minds and more information from other angles into the conference.

Dr. Woodward. Mr. Chairman, I would move the following substitute for this resolution:

Resolved, That the conference recommends the appointment of a committee to report at the next annual meeting on possible methods of increasing the efficiency and extending the influence of future conferences.

(Motion seconded and substitute adopted.)

PELLAGRA.

Dr. Sawyer:

Resolved, That this conference is of the opinion that the preponderance of evidence indicates that pellagra is a dietary disease, and that the only method which furnishes a practical means for treatment and prevention of the disease is by a properly balanced diet of fresh animal food and legumes.

(Adoption moved by Dr. Tuttle and seconded.)

Dr. Fulton. Mr. Chairman, I have very grave doubt about the propriety of passing a resolution of that sort at all. I conceive we are here to consider administrative matters and questions of that sort, but I doubt very seriously the competence of this committee to express an opinion at all on that resolution, one way or the other. What I say for myself I take the liberty of saying for at least half the people present—that they are absolutely incompetent to vote on a question of that sort.

Dr. Lumsden. Mr. Chairman, I think this is one of the most potent items which has been reached in the program of this conference. I think for a resolution on this subject to be tabled by this conference it would have a very serious effect. If we do believe at this time that the best we can do for the treatment and for the prevention of pellagra is to feed the people and feed them a certain kind

of diet, the tabling of this resolution by this conference would be a grave mistake. Such action would set back very seriously the good results of the work done and being done. If this resolution is to be voted on, I suggest, if it is in order at this conference, that we have either a roll call or a rising vote on it. If the health officers of this country are ready at this time to express an opinion about the best method for the prevention and for the cure of pellagra, I think that proper action on this resolution now will do much to lift from our people a great burden of suffering. I think a resolution of this character coming from this conference at this time and being published, so that the people of the country would know that the health officers of the different States gathered here in this conference agreed that this is the best that can be done for the prevention and cure of pellagra, would have a very wholesome effect, and would start a lot of people to eating meat, eggs, milk, and beans who otherwise could not be expected to start eating them for some years to come.

Dr. Leathers. Mr. Chairman, I simply want to emphasize the remarks of Dr. Lumsden. In many of the Southern States this problem of pellagra is a very serious one. It stands next to tuberculosis, perhaps, in importance, and increases the death rate enormously. The most frequent question asked by the people of health officials is, What is the cause of pellagra? Now, if we are put into the attitude of feeling that in any action by this conference we had better be very cautious and qualify our statement, our action would have very little effect with these people. They are not in a position to analyze a statement of that kind, and if they see that you doubt in the least what you are trying to accomplish, they will have an even greater doubt in regard to the matter.

I am not very much informed on all of the work that has been done on pellagra, but it is my candid opinion that the resolution states the truth; and we ought not to be afraid of the truth. So I am heartily in favor of the resolution. I think it would be a great mistake not to adopt it.

Dr. Goldberger. Mr. Chairman, I should like to say a word or two for the information of the conference. I think the majority of the gentlemen here are from States where pellagra is hardly a problem worth serious consideration, and in all probability have paid little or no attention to the matter and think it not of sufficient importance to take up at this conference. To a very large part of the country, however, it is a matter of the most profound and vital importance, affecting as it does the health, life, and economic status of, roughly, all of the Southern States. I may say, too, for the information of the gentlemen not from that section, that as a matter of practical fact quite a number of the Southern States are actually working along these lines; and to pass these resolutions would be

simply giving those men who are already, on their own initiative, doing this thing the moral support of the conference. For example, I believe North Carolina has taken or is about to take official action in the control and prevention of pellagra along dietary lines. I know that Dr. Hayne has stated—I am sorry he is not here to state it for himself—that he appealed to his last legislature for an appropriation to take up the fight along these lines. I know that the State of Florida is officially working along these lines. I know it also to be a fact that the State of Louisiana has, at least tentatively, taken this up and is trying to do what it can to fight the disease on dietary lines. I know that officially Arkansas has taken similar action. I understand that Tennessee, Kentucky, and Virginia are in the same position. Therefore, as a matter of practical fact, what these resolutions state would be simply supporting these men who are pioneers in taking this fight up against what may be the majority opinion of the medical profession.

These are the reasons why, in my opinion, it is of such great practical importance for this conference to pass this or substantially this resolution.

Dr. Sawyer. There are two very distinct parts to this resolution. One is that those of us who have read the reports and are judging on the basis of merely passing on the evidence believe that the preponderance of the evidence indicates or suggests that the disease is a dietary disease. That is one part which we can consider separately if necessary. The other part is that we believe that dietary treatment is the only method which is promising in the present state of our knowledge. I think it might clear up the matter a great deal if we found out from Dr. Fulton whether he is objecting to the whole resolution, to both parts, or only to one part; and if so, which part it is which is objected to.

Dr. Fulton. Mr. Chairman, I would like to make my position perfectly clear. I think it is very unfortunate for a conference of this sort to pass on such matters at all. It seems to me that the fact that there is an argument for a resolution is sufficient to take away all the ground on which it was offered here. There are a certain number of people here whose opinions are of value on a question of that sort. Now, it is thought that those opinions can be strengthened by getting the votes of a lot of people who know nothing whatever about it. If that question comes to a vote, there is only one of two things that can be done; a man can vote aye or he can vote no. I intend, if it comes to a vote, to vote no. My vote no will simply signify that I know nothing whatever about it. But I do think that the resolutions ought not to be passed. I think it would be a very bad precedent, no matter what the merits of the question at issue are. We will be undertaking to add to a certain body of scientific opinion. If all

who are as ignorant as I am on the subject should vote no, the resolution would still pass. But in what sense would the opinion be strengthened? In none whatever. On the contrary, the very fact that there seems to be a great desire to have a thing of that sort passed would seem to me to indicate some inherent weakness in the argument. Scientific questions are never settled by counting ayes and noes. If Dr. Goldberger is right, as I hope he is, his opinion on that is worth a thousand of mine, and a carload of my votes would have no value whatever. It is a perfectly fictitious way of supporting a scientific assertion. That is the reason why I expect to vote no, and I should be very sorry if the conference should establish the precedent of taking votes on questions of that sort.

Mr. HANSEN. Mr. Chairman, as an engineer I am somewhat in the same position as the previous speaker, but I think the matter can be settled in this way: We are all sanitarians, and we are all competent to judge of the great value of the work of Dr. Goldberger and his associates, and I think therefore we are competent to say specifically that we know about his work, that we approve of it, and that we believe that proper diet will both prevent and cure the disease, and therefore we would recommend that dieting be used as a means of combating the disease.

Dr. LUMSDEN. My understanding of this resolution is that it is not a question of the scientific determination of the cause of pellagra, but rather a question of propaganda. Are State health officers in a position now to advocate any line for the prevention or for the cure of pellagra? It is to determine whether this conference is ready to go on record as advocating a definite line for the prevention and cure of pellagra.

The ACTING CHAIRMAN. Do you regard the resolution as well worded to convey the meaning that you have given it?

Dr. LUMSDEN. It impressed me as covering the ground. If anybody asked me what to do with persons suffering from pellagra, I would say, "Feed them"; and I think most of us feel that way. So why not go on record?

Dr. BRACKEN. Mr. Chairman, I do not know any more about this than Dr. Fulton does. As I look at it, it seems to me that the resolution represents rather a vote of confidence in the work that has been done so far, and as an ignoramus on the general subject I am ready to vote yes on the resolution.

The ACTING CHAIRMAN. If I may say a word, I should not want, as an officer of the service, to see a resolution passed which would simply be a vote of confidence. We propose to carry on such investigations as we undertake so that people will have confidence in them; and until we do, they do not need to accept them. The simple question appears to me to be whether, as administrative officers, we are

at this time in a position to advise individuals and communities of a method which has been successful, and which for the time being at least should be adopted, both for the cure and for the prevention of pellagra.

Dr. Bracken. I agree with you, Mr. Chairman, as to a mere vote of confidence, but that is not worded as a vote of confidence. It is in a sense a vote of confidence, when it comes to a man like myself voting yes.

Dr. Seemann. Mr. Chairman, I do not believe that this question is being looked at in the proper light. We are not here to decide whether bacillus Welchii is the cause, or whether Harris's monkey had pellagra, or whether anything else happened. We are here to take advantage of definite results which have taken place in the Southern States. In the Bogalusa Hospital trials were made of this dietary treatment of pellagra, and the results have been most excellent—above our expectations. Likewise in many other parts of Louisiana I have personally observed the most excellent results. Now, we are not concerned, as I remarked, about what is the cause of pellagra from the strictly scientific standpoint; but we do know, as sanitarians and health officers, that this dietary treatment gives results both for prevention and for cure, and it is wrong for us as health officers not to stand boldly and proclaim this fact, which is called a theory, to the public who trust to us for advice, in order that they may be protected from the hordes of quacks who prey on pellagra victims. Why, you gentlemen have no conception of the amount of charlatanism that is going on in connection with pellagra, and if you refuse to adopt this resolution you virtually, by your negative vote, break down the very foundation upon which our work is founded, and you leave us in the South in a most humiliating position of having to tell our people down there that we have been telling them to do something that the conference of health officers found inadvisable; because no other conception can be taken of a vote to table or a negative vote on this proposition. It is before us now. It might have been more fortunate had it not been presented, but we have it here, and it is a question that we must be men enough to decide. I believe that anybody who knows anything about the subject can only decide it one way.

Dr. Woodward. Mr. Chairman, I sympathize somewhat with Dr. Fulton in his point of view with respect to part of this resolution, although I think he has hardly given it the attention it deserves.

The first clause pretty nearly damns the case by its weakness, that is, "that the preponderance of evidence indicates that pellagra is a dietary disease." I do not think we can question that very seriously. We will have to agree that the preponderance of the evidence at present does indicate that. But we are not even putting our-

selves on record that pellagra is a dietary disease. The clause is so weak that it is liable to hurt the cause. Dr. Fulton is right to this extent, that, so far as the public is concerned and so far as the medical profession is concerned, this clause might indicate that we, really not a scientific body, were undertaking to determine a scientific fact.

Everyone will have to admit, no matter what he may believe with respect to the causation of pellagra—and I will be perfectly frank and say I have not made up my mind as to the cause—that it has been demonstrated that by the use of improper foods pellagra can be caused, and that by the use of proper foods it can be cured.

Dr. Seemann. Put that into the resolution.

Dr. Woodward. So far as causation is concerned, however, we have a similar situation in respect to quinine in malarial fever. It is not the absence of quinine that causes malarial fever, although if it be withheld in a malarial region malarial infection is apt to follow and the administration of quinine will cure it. So the fact that an improper diet precedes the occurrence of pellagra, and the administration of a proper diet cures it, does not necessarily mean that the diet had anything to do with the causation. I think, though, we could all go on record in a resolution, as an administrative body, that the only known method which at present furnishes any hope for the prevention of pellagra, or for the cure of pellagra, is a properly balanced diet—including, we will say, fresh meat and legumes. We could indorse that, and I think it would accomplish the purpose sought.

Dr. Stiles. Mr. Chairman, it seems to me that in the original resolution there is an unfortunate expression used—that the diet is the only method to cure pellagra, or words to that effect. In the discussion another point has been brought out, that in our present knowledge that is the only method. It seems to me that qualification should appear in the resolution.

Dr. Goldberger. Mr. Chairman, if I may be permitted to remark once more, I think, perhaps, Dr. Fulton is absolutely right when he takes the position that no body such as this (or any other body, for that matter) can by any sort of resolution or series of resolutions decide a scientific question. Scientific questions are never settled that way, although they may appear to be. Mr. Hansen has stated the point quite correctly. We may not all of us know whether John Smith murdered Jane Smith, but we are competent, if we are endowed with average intelligence, to pass on the competency of evidence adduced. Now, in this case, too, a certain matter is brought forward for the opinion of the conference, and the conference is presumed to be able to pass on the sufficiency of the evidence that has been adduced. The resolution simply calls for an expression of

opinion as to certain facts relating to the treatment and prevention of pellagra. I think, perhaps, it would be a better resolution if it were put in somewhat the way Dr. Woodward has suggested: That it has been proven that pellagra may be produced by an improper diet, and that pellagra may be cured or prevented by a proper diet, and therefore be it resolved that we recommend to all health officials and others concerned that appropriate action be taken with respect to the carrying out of these measures looking to the prevention and treatment of the disease.

There is just one other point I would like to touch on. The point Dr. Woodward made in connection with the matter of the cause of pellagra was this, that the fact that malaria is prevented by quinine does not prove that the absence of quinine produces malaria; and by analogy that, although proper diet prevents pellagra, that does not prove that the absence of proper diet produces pellagra.

This is an exceedingly interesting and enticing form of argument. The only difficulty with it, it seems to me, is this, that the analogy is incomplete and imperfect. This argument would be entirely valid, provided quinine were a usual, essential ingredient of a normal diet. But inasmuch as it is not, the argument falls to the ground.

Dr. Woodward. Unless the committee on resolutions has drafted something superior to my phraseology I would offer a resolution as a substitute, something as follows:

Whereas, in the judgment of the conference of State and Territorial health officers with the United States Public Health Service, it has been demonstrated that the absence of a proper diet may be followed by pellagra, and that the consumption of a proper diet will prevent and cure the disease; Therefore be it

Resolved, That this body recommends that as a standard and routine method for the prevention and cure of pellagra the health authorities endeavor to bring about the use of proper dietaries, including fresh meat and legumes.

Dr. Fulton. Mr. Chairman, is my objection precipitating all this effort to make a very agreeable kind of resolution? Because, if so, it is quite unnecessary. My objection is to the resolution as a whole and the policy of this conference. It is a perfectly simple matter to pass it. I do not know anybody who is going to vote against it except myself, and I do not think my vote signifies anything at all. I simply object to being counted as voting on a question on which I have no competent opinion.

Dr. Biddle. Mr. Chairman, without rising to my feet I suggested placing the resolution upon the table. Now I will show you how inconsistent I am. The State Board of Health of Michigan is on record as adopting this precise resolution. Pellagra was declared noncommunicable in September of last year, and we have practically gone on record in black and white to the entire State of

Michigan in almost the language that is in this resolution, so that I would be voting against my own act if I voted against the resolution and what it contains.

Dr. STILES. Mr. Chairman, I would like to offer the following substitute to the original resolution:

Whereas, it has been demonstrated that a properly balanced diet will prevent and cure pellagra; therefore, be it

Resolved, That the conference indorses the use of a properly balanced diet as the only method now known by which the disease may be combated.

(The substitute resolution offered by Dr. Stiles was seconded and adopted.)

MORBIDITY REPORTS.

Resolved, That the annual reports forwarded to the Public Health Service by State and Territorial health departments, showing the recorded prevalence of disease during the preceding calendar year and containing a statement of the number of reported cases and of registered deaths from each of the notifiable diseases, can with advantage be changed to two separate reports, as follows: (1) A report of cases of notifiable diseases, to be mailed by the several State health departments not later than February 1; and (2) a report of registered deaths from the notifiable diseases, to be mailed by the several State health departments not later than March 1.

(The resolution was adopted.)

REPRESENTATION OF STATES AND TERRITORIES AT CONFERENCES.

Whereas, effective public health work and its growth in the United States depend upon cooperation and correlation of the work of the several State health departments with each other and with the Federal Public Health Service, and whereas only 28 States and Territories and the District of Columbia are represented at this conference; therefore, be it

Resolved, That it is the feeling of the conference that the loss has been double, that the conference has been deprived of the benefits of the counsel and experience of the States and Territories not represented, and that they have been deprived of the benefits derived from the personal exchange of experience and the discussion resulting therefrom.

(The resolution was adopted.)

COMMITTEE APPOINTMENTS.

The ACTING CHAIRMAN. There were two committees provided for during this forenoon's session, and I will read the names of those committees at this time.

COMMITTEE ON RURAL SANITATION.

The committee on rural sanitation will consist of Drs. Rankin, Tuttle, Dalton, Hayne, and Lumsden.

COMMITTEE ON INTRASTATE QUARANTINE REGULATIONS.

The committee on intrastate quarantine regulations will consist of Drs. Woodward, Garrison, Sawyer, Kelley, and Rucker.

There are two or three other regular committees which have been provided for by resolution, and if agreeable to the conference the membership will be made up later and communicated by correspondence.[1]

Dr. Woodward. Mr. Chairman, I hope you will leave me off that committee on intrastate quarantine regulations. My intrastate quarantine regulations are delightfully simple, with an area of 60 square miles only, and I have no experience and no particular knowledge.

The Acting Chairman. Dr. Woodward, I feel that when the committee takes up the work it will not really be as complex and relate to States and Territories, but that it will deal more with principles and harmonizing or bringing about uniformity in interstate quarantine matters. So I feel that the department would be losing by your being relieved from the committee.

Dr. Jepson. I move, Mr. President, that the thanks of this body be tendered to the United States Public Health Service, which has shown us so many courtesies.

(The motion was seconded.)

(The question was put by Dr. Woodward, and carried unanimously by a rising vote.)

The Acting Chairman. On behalf of the bureau and department I wish to thank the delegates and guests for their presence here; and if there is no other matter of business I will declare the conference adjourned.

(Accordingly, at 5.30 p. m. the conference adjourned.)

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[1] Membership of other committees established at this conference will be found on p. 6.

STATE AND TERRITORIAL EXECUTIVE HEALTH OFFICERS.

Alabama.—Dr. W. H. Sanders, State health officer, Montgomery, Ala.

Alaska.—Gov. J. F. A. Strong, ex-officio commissioner of health, Juneau, Alaska.

Arizona.—Dr. R. N. Looney, superintendent of public health, Prescott, Ariz.

Arkansas.—Dr. C. W. Garrison, State health officer, Little Rock, Ark.

California.—Dr. W. A. Sawyer, secretary State board of health, Sacramento, Cal.

Colorado.—Dr. S. R. McKelvey, secretary State board of health, Denver, Colo.

Connecticut.—Dr. John T. Black, secretary State board of health, Hartford, Conn.

Delaware.—Dr. A. E. Frantz, secretary State board of health, Wilmington, Del.

District of Columbia.—Dr. W. C. Woodward, health officer, Washington, D. C.

Florida.—Dr. J. Y. Porter, State health officer, Jacksonville, Fla.

Georgia.—Dr. H. F. Harris, secretary State board of health, Atlanta, Ga.

Hawaii.—Dr. J. S. B. Pratt, president board of health, Honolulu, Hawaii.

Idaho.—Dr. Ralph Falk, secretary State board of health, Boise, Idaho.

Illinois.—Dr. C. St. Clair Drake, secretary State board of health, Springfield, Ill.

Indiana.—Dr. J. N. Hurty, State commissioner of health, Indianapolis, Ind.

Iowa.—Dr. G. H. Sumner, secretary State board of health, Des Moines, Iowa.

Kansas.—Dr. S. J. Crumbine, secretary State board of health, Topeka, Kans.

Kentucky.—Dr. A. T. McCormack, secretary State board of health, Bowling Green, Ky.

Louisiana.—Dr. Oscar Dowling, president State board of health, New Orleans, La.

Maine.—Dr. A. G. Young, secretary State board of health, Augusta, Me.

Maryland.—Dr. J. S. Fulton, State health officer, Baltimore, Md.

Massachusetts.—Dr. A. J. McLaughlin, State commissioner of health, Boston, Mass.

Michigan.—Dr. J. L. Burkart, secretary State board of health, Lansing, Mich.

Minnesota.—Dr. H. M. Bracken, secretary State board of health, St. Paul, Minn.

Mississippi.—Dr. J. T. Gilleylen, secretary State board of health, Jackson, Miss.

Missouri.—Dr. J. A. B. Adcock, secretary State board of health, Jefferson City, Mo.

Montana.—Dr. W. F. Cogswell, State health officer, Helena, Mont.

Nebraska.—Dr. H. B. Cummins, secretary, board of secretaries, State board of health, Seward, Nebr.

Nevada.—Dr. S. L. Lee, secretary State board of health, Carson City, Nev.

New Hampshire.—Dr. I. A. Watson, secretary State board of health, Concord, N. H.

New Jersey.—Dr. Jacob C. Price, director State department of health, Branchville, N. J.

New Mexico.—Dr. W. E. Kaser, secretary of State board of health, Las Vegas, N. Mex.

New York.—Dr. Hermann M. Biggs, State commissioner of health, Albany, N. Y.

North Carolina.—Dr. W. S. Rankin, State health officer, Raleigh, N. C.

North Dakota.—Dr. C. J. McGurren, superintendent of public health, Devils Lake, N. Dak.

Ohio.— ——— secretary State board of health, Columbus, Ohio.

Oklahoma.—Dr. John W. Duke, State commissioner of health, Oklahoma City, Okla.

Oregon.—Dr. David N. Roberg, State health officer, Portland, Oreg.

Pennsylvania.—Dr. Samuel G. Dixon, State commissioner of health, Harrisburg, Pa.

Philippine Islands.—Dr. J. D. Long, director of public health, Manila, P. I.

Porto Rico.—Dr. William F. Lippitt, director of sanitation, San Juan, P. R.

Rhode Island.—Dr. Gardner T. Swarts, State commissioner of health, Providence, R. I.

South Carolina.—Dr. James A. Hayne, State health officer, Columbia, S. C.

South Dakota.—Dr. P. B. Jenkins, superintendent of public health, Waubay, S. Dak.

Tennessee.—Dr. R. Q. Lillard, secretary State board of health, Nashville, Tenn.

Texas.—Dr. W. B. Collins, State health officer, Austin, Tex.

Utah.—Dr. T. B. Beatty, secretary State board of health, Salt Lake City, Utah.

Vermont.—Dr. Charles F. Dalton, secretary State board of health, Burlington, Vt.

Virginia.—Dr. Ennion G. Williams, State commissioner of health, Richmond, Va.

Washington.—Dr. T. D. Tuttle, State commissioner of health, Seattle, Wash.

West Virginia.—Dr. S. L. Jepson, State commissioner of health, Charleston, W. Va.

Wisconsin.—Dr. C. A. Harper, secretary State board of health, Madison, Wis.

Wyoming.—Dr. W. A. Wyman, State health officer, Cheyenne, Wyo.

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TREASURY DEPARTMENT
UNITED STATES PUBLIC HEALTH SERVICE

PUBLIC HEALTH BULLETIN No. 83
DECEMBER, 1916

TRANSACTIONS OF A SPECIAL CONFERENCE OF STATE AND TERRITORIAL HEALTH OFFICERS WITH THE UNITED STATES PUBLIC HEALTH SERVICE, FOR THE CONSIDERATION OF THE PREVENTION OF THE SPREAD OF POLIOMYELITIS

HELD AT WASHINGTON, D. C.
AUGUST 17 AND 18, 1916

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TELEGRAM CALLING THE CONFERENCE.

The following telegram was addressed to the health authorities of the States, Territories, and the District of Columbia:

TREASURY DEPARTMENT,
BUREAU OF THE PUBLIC HEALTH SERVICE,
Washington, August 9, 1916.

Under authority public-health law 1902 conference of State and Territorial health authorities with Public Health Service is called to meet this office 10 a. m. Thursday, August 17, to consider poliomyelitis situation and bring about greater uniformity in methods of control. Representation of your State urgently requested. Wire name of delegate.

A. H. GLENNAN,
Acting Surgeon General.

PROVISIONAL PROGRAM.

Opening remarks by the Acting Surgeon General.
Address by the Secretary of the Treasury.
Roll call of delegates.
The poliomyelitis situation in the various States.
The prevention of the interstate spread of poliomyelitis.
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TRANSACTIONS

OF A

SPECIAL CONFERENCE OF STATE AND TERRITORIAL HEALTH AUTHORITIES WITH THE UNITED STATES PUBLIC HEALTH SERVICE

FOR THE CONSIDERATION OF THE

PREVENTION OF THE SPREAD OF POLIOMYELITIS.

MORNING SESSION, AUGUST 17, 1916.

The conference was called to order at 10.15 o'clock a. m. by the chairman, Acting Surg. Gen. A. H. Glennan, the following being present:

REPRESENTATIVES OF THE PUBLIC HEALTH SERVICE.

Asst. Surg. Gen. W. G. Stimpson.
Asst. Surg. Gen. J. W. Kerr.
Asst. Surg. Gen. W. C. Rucker, secretary.
Asst. Surg. Gen. R. H. Creel.
Asst. Surg. Gen. J. W. Trask.
Senior Surg. C. E. Banks.
Surg. Hugh Cumming.
Surg. L. E. Cofer.
Surg. C. H. Lavinder.
Surg. G. W. McCoy.
Surg. B. S. Warren.
Surg. A. M. Stimson.
Passed Asst. Surg. W. H. Frost.
Passed Asst. Surg. J. P. Leake.
Passed Asst. Surg. W. F. Draper.
Prof. C. W. Stiles.

STATE DELEGATES.

Alabama, Dr. Glenn Andrews.
Arizona, Dr. E. P. Palmer.
Arkansas, Dr. C. W. Garrison.
California, Dr. Guy E. Manning.
Colorado, Dr. S. R. McKelvey.
Connecticut, Dr. John T. Black.
Delaware, Dr. W. P. Orr.
District of Columbia, Dr. W. C. Woodward.
Florida, Dr. J. Y. Porter.
Illinois, Dr. C. St. Clair Drake.
Indiana, Dr. W. F. King.
Iowa, Dr. Henry Albert.
Kentucky, Dr. J. N. McCormack.
Louisiana, Dr. Oscar Dowling.
Maine, Dr. A. G. Young.
Maryland, Dr. John S. Fulton.
Massachusetts, Dr. A. J. McLaughlin.
Michigan, Dr. John L. Burkart.
Minnesota, Dr. H. M. Bracken.
Missouri, Dr. J. A. B. Adcock.
Montana, Dr. F. A. Cooney.
Nebraska, Dr. E. A. Carr.
New Hampshire, Dr. I. A. Watson.
New Jersey, Dr. R. D. Fitz-Randolph.
New York, Dr. George Draper.
North Carolina, Dr. W. S. Rankin.
Ohio, Dr. F. G. Boudreau.
Oregon, Dr. D. N. Roberg.
Pennsylvania, Dr. S. G. Dixon.
Rhode Island, Dr. G. T. Swarts.
South Carolina, Dr. J. A. Hayne.
South Dakota, Dr. E. B. Jenkins.
Tennessee, Dr. H. H. Shoulders.
Texas, Dr. W. B. Collins.
Vermont, Dr. H. A. Ladd.
Virginia, Dr. E. G. Williams.
Washington, Dr. T. D. Tuttle.
West Virginia, Dr. C. R. Weirich.
Wisconsin, Dr. C. A. Harper.

GUESTS.

Dr. Haven Emerson, commissioner of health, New York City.
Dr. W. W. Ford, associate professor of hygiene, Johns Hopkins University.
Dr. John D. Blake, health commissioner of Baltimore.
Dr. J. D. Hagard, South Boston, Va.
Dr. Ernest C. Levy, chief health officer, Richmond, Va.
Dr. Arch Cheatham, Durham, N. C.
Dr. J. Mitchell Reese, Phillipsburg, N. J.
Dr. T. F. Abercrombie, Brunswick, Ga.
Dr. Thomas Reid Crowder, superintendent of sanitation, Pullman Car Co., Chicago, Ill.
Dr. Arthur T. Wolff, Connecticut State board of health, Hartford, Conn.
Dr. William Egleston, South Carolina board of health.
Dr. A. J. Wheeler, representing Office of Indian Affairs, Washington, D. C.
Dr. James D. Love, Jacksonville, Fla.
Dr. B. M. Little, Clarksville, Tenn.
Mr. Tolley A. Biays, Maryland.
Mr. Mosby G. Perrow, Lynchburg, Va.
Dr. Arthur M. Wright, Erie Railroad, New York City.
Mr. W. C. Hope, general passenger agent Central Railroad of New Jersey, New York City.
Mr. E. R. Scoville, Baltimore & Ohio Railroad Co.
Dr. D. Z. Dunott, Western Maryland Railroad Co.
Dr. E. M. Parlett, Baltimore & Ohio Railroad Co.
Mr. N. S. Burns, Pittsburgh, Pa.
Dr. G. N. Thomas, representing El Paso County and El Paso city, Tex.
Mr. E. B. Hunt, superintendent relief department, Pennsylvania Railroad.
Dr. W. A. Applegate, chief surgeon Southern Railway, Washington, D. C.
Dr. J. M. Wainwright, chief surgeon Delaware, Lackawanna & Western Railroad.
Mr. S. B. Hege, district passenger agent Baltimore & Ohio Railroad, Washington, D. C.
Dr. A. G. Oppenheimer, Chesapeake & Ohio and Richmond, Fredericksburg & Potomac Railroads, Richmond, Va.
Mr. C. F. Smith, general superintendent passenger transportation New York Central, New York City.
Mr. Charles C. Pauling, solicitor New York Central Railroad, New York City.
Dr. Frederick L. Hoffman, Prudential Insurance Co., Newark, N. J.

The CHAIRMAN. This conference is called in accordance with the act of Congress of July 1, 1902, to consider the prevalence at the present time of poliomyelitis and to discuss with you, as representatives of the health organizations of the various States, ways and means of preventing its spread. In opening the conference I wish to state that Surg. Gen. Blue is incapacitated by an attack of sciatica, and will therefore be unable to be present. He wishes me to express to the conference his sincere regret at his enforced absence and to assure the delegates of his deep interest in the subject under consideration.

We have the honor of having with us this morning the Hon. William G. McAdoo, Secretary of the Treasury, to whom I might apply in addition the title of Secretary of Public Health. [Applause.] Since the beginning of the present outbreak of poliomyelitis he has taken deep interest in the situation. I take great pleasure in presenting to you Secretary McAdoo. [Applause.]

ADDRESS OF SECRETARY M'ADOO.

Secretary McAdoo. Dr. Glennan and gentlemen, I welcome you heartily to Washington. I wish that the occasion of your visit were something less serious than the subject that calls you here. We are facing another epidemic of infantile paralysis—that baffling and mysterious disease which has brought so much woe to New York City and has thus far proven itself beyond the control of science. We have had as a natural consequence of a mysterious and deadly epidemic of this sort a great deal of alarm and a great deal of hysteria in some places. This has resulted in all kinds of regulations by State and local authorities, resulting in a great variety and form of effort to prevent the spread of the disease. The purpose of these regulatory measures is in the highest degree commendable, but without some sort of a uniform direction—cool-headed direction—our efforts will be less effective than they ought to be, and unnecessary inconvenience will inevitably be placed upon the public. Now, the Public Health Service, which has a very definite function under the national authority, is trying to exercise its powers in cooperation with the powers exercised by the health authorities of the different States in order that a more coordinated and effective effort may be made to fight the mysterious enemy. We have asked you to come here for the purpose of exchanging views, and after a calm and well-considered discussion, of determining what is the most intelligent and useful thing to do in the circumstances.

My experience with panics—we have had to approach very near to some of them since I have been in the Treasury Department, panics not occasioned by the presence of physical disease, but mental disease of a financial sort—has led me to realize the importance of cooperative effort, of intelligent discussion of problems with a view to ascertaining what the real problems are, and then, like commonsense and courageous people, taking them up and trying to find a solution for them.

I have great confidence in this conference. I am so naturally a believer in the efficacy of human effort that I never look at things as impossible. I am unwilling to admit that anything is impossible that is within the range of human effort, and I have great hopes therefore that you are going to be able, as a result of these delibera-

tions, to concert immediate measures for better and more effective cooperation between the different communities of the United States, develop a better understanding of the difficult problem before us, and devise measures that will confer a minimum of inconvenience and a maximum of benefit upon the public. That is what we are striving to do, so far as the regulatory features are concerned, and I recommend to you gentlemen a thorough consideration of these phases of the problem.

Now, the other side of the problem is scientific. With regard to that I have no suggestions to offer, because you men of science know better how to deal with it than I do. But I am exceedingly hopeful that as a result of the exchange of ideas here you may get additional light upon this subject, and that you may at least be able to concert new measures and investigations that will give promise of the discovery soon of a remedy for this deadly disease, so that it may be removed as a menace to the human race.

I have great respect for the noble profession you gentlemen represent, and I wish to say to you that among the many activities of the Treasury Department no one of them appeals to me more strongly than the Public Health Service. It has potentialities of the utmost importance to the American people. I believe that, great as the service it has already performed, it can be made an even more effective instrument in the service of the people of this country than it has already been. In saying that I do not mean that an enlargement of its powers is going to bring it into conflict with the proper powers of the States, but, on the contrary, we can make the national instrument a far more effective agency of cooperation with the State health authorities than it is at the present time. I believe I may claim, without exaggeration, that under Surg. Gen. Blue's administration—and I hope that I have been able to further it to some extent myself—the Public Health Service is to-day performing a larger and more useful service to the American people than it ever has done before.

So I welcome you, gentlemen; I welcome you most heartily to this city, and I assure you that the services of the Treasury Department are placed unreservedly at your disposal, and that you can depend upon the unlimited cooperation of this department in the noble work you have undertaken.

Gentlemen, I am sorry I can not stay with you. I do not know anything that would please me more than to take part in your deliberations, but unfortunately I am under very great pressure, and I have so many other things to do that I must leave you now and look after other matters. [Applause.]

The CHAIRMAN. The secretary of the conference will now call the roll of States.

(The secretary here called the roll of States.[1])

The SECRETARY. Those who are guests of the conference will please write their names and addresses and deliver them to the secretary, writing at the top of the paper the word "guest."

The CHAIRMAN. I wish to announce that the official delegates only have the right to vote. Later we will be glad to extend the privileges of the floor to our guests. We have quite a number of them.

This is a tentative program and is subject to change at any time so that we may get along with the business in hand. The first subject is "The poliomyelitis situation in the various States." It seems to me it would be well to have the secretary call the roll, and as each representative's name is called, let him make a short statement of the poliomyelitis situation in his State. Remarks on this head are limited to 5 minutes. The secretary will call the roll.

The SECRETARY. Dr. Glenn Andrews, of Alabama.

Dr. ANDREWS. You want the condition just as it is now, Mr. Chairman?

The CHAIRMAN. Just give us an idea of the conditions in your State—the present conditions.

Dr. ANDREWS. We did not have poliomyelitis reported upon, except along with other diseases, until after this outbreak in New York. Since then we have had special reports. On July 13 the State board of health sent out a notice to the county health officers requiring that infantile paralysis be reported instantly in every case by telegraph. We require all contagious diseases to be reported by mail. Poliomyelitis was ordered to be reported by telegraph. From July 13 to 24, inclusive, 77 cases were reported from 17 counties. From August 1 to August 14 there have been reported 17 cases in five additional counties, making 94 cases reported in 22 counties. One county, Jefferson, has reported a total of 24 cases. The number of cases from other counties has varied from 1 to 3.

Before this year we have had cases of infantile paralysis reported with other diseases. Last year there were reported 24 deaths for the entire year, which at the rate of 1 death to 10 cases would be about 240 cases in the State. The cases this summer thus far have been widely scattered. I have brought with me a map outlining the location of the disease, and with the exception of one county, Jefferson, there has been no appreciably large number of cases. That county, which is the largest in the State, shows 24 cases, and you will see how widely scattered the disease has been. [I will leave that map with you.]

The SECRETARY. Dr. C. W. Garrison, of Arkansas.

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[1] The list of those present is given on page 9.

Dr. GARRISON. Mr. Chairman, I have been out of the State for three weeks, but up to the time I left there we had had three cases, one in the southwest section of the State and two in the northeast.

About four years ago Arkansas had an epidemic of poliomyelitis in the southwestern part of the State, with 150 to 200 cases, and the Public Health Service made an investigation. The board has been watching the reports, but the three cases only having been notified, no special action has been taken.

The SECRETARY. California; Dr. Guy E. Manning.

Dr. MANNING. California has to report two cases. We have had endemic cases in the State in previous years, but under supervision of the city and State authorities the spread of the disease has been prevented. This year we have had, since the epidemic was reported in the East, four cases, one in San Francisco, which was not diagnosed on the train, but which was afterwards found to have come from New York, reaching California in about six days after it had left there, coming direct. This case proved to be a true case of poliomyelitis. It was taken in hand by the health authorities and quarantined, and from that case there has been no spread.

A few miles from there by rail there has been another case reported. That also came from outside of the State. In the southern part of the State there have been two cases. So I think four cases will cover all that we have to-day. These cases have all, of course, come from other States, so that while we do not fear the spread of poliomyelitis, we are watching conditions very closely. California is entered by four lines of railroad, and all of these connect with almost all eastern points. Inspection has been established at the boundary lines of the State, all children being inspected before they are allowed to enter.

The SECRETARY. Colorado; Dr. S. R. McKelvey.

Dr. MCKELVEY. Mr. Chairman, Colorado requires the immediate reporting of all communicable diseases, which, of course, includes poliomyelitis. During the present year there have been only four cases reported, and we have been unable to trace the origin of any of these cases to the East. They are probably sporadic cases, without any actual indication as to just where they may have had their origin. One of these cases was in a western county in the State, near the Utah line, one of them was in Boulder County, 12 or 15 miles out of Denver. The remaining two cases were in the city of Denver. One of these is now convalescent and will soon be out of quarantine, and the other has been out of quarantine for some little time. The two cases occurred within about one month of each other. That is all that I am able to report as to the disease in my State. We are watching things very closely and are trying to keep track of all people, especially those having children with them, coming from the East.

The SECRETARY. Connecticut; Dr. John T. Black.

Dr. BLACK. Connecticut had three cases in June, apparently sporadic; in July, 165; and in August, 155, making 320 since the 1st of July. Of the first 200 cases in Connecticut, 34 were nonresidents, having come recently from New York.

The present problem of the disease in Connecticut is peculiar, owing to our proximity to New York and the cheap transportation facilities which are offered to the poorer classes by the Sound lines, trolley and automobiles also affording close connection. The spread of the disease to the State has been by these different routes. We have established in Connecticut about 20,000 children from New York at the present time. They are divided into different classes, the largest class being the Jewish population. They come in on the farms, anywhere from 10 to 80 to a farm. It has been from these sources that we have been getting most of the direct and indirect exposures—I mean direct cases from New York and the New York exposures. In the tobacco district we are finding the infection among the Italians, owing to the influx of labor for the tobacco harvest; in the Italian districts of Connecticut, in Stamford, Bridgeport, and New Haven, they have used registration and observation, and local communities in some instances have adopted rigid quarantine measures against New York, which will no doubt come out later.

The SECRETARY. Delaware; Dr. W. P. Orr.

Dr. A. E. FRANTZ. Mr. Chairman, Dr. Orr has very kindly shifted the responsibility of responding for our very large State. We have had in Delaware but two cases of poliomyelitis. Our population is only 215,000. These two cases have been of children, one 3 years and the other 5 years of age. They have both been residents of Delaware. We, however, claim that they were both imported cases; that is, the disease was brought into the State by the children themselves. The first patient visited New York July 4, returning from there on July 5. On July 11 the child was taken with vomiting, fever, etc., the usual symptoms, with slight paralysis of the left leg following in a day or so. This was a mild case and it is recovering, there being no paralysis remaining.

The other case was that of a boy 5 years of age, who visited Philadelphia August 5, where he traveled on the trolley cars as far as Willow Grove, returning the next day. On the 12th he was taken with vomiting, headache, fever, and symptoms of poliomyelitis, although he had been complaining for a few days before. He had complete paralysis of the right limb. Partial paralysis of the muscles of deglutition and respiration developed, and at 4 o'clock on Wednesday morning—the 14th—the boy died. This was an imported case.

We have no other cases in Delaware at the present time. We feel that the quarantine regulations in Delaware are quite rigid. When cases are brought to our notice we establish an absolutely rigid quarantine, which extends for a period of 21 days after disinfection or recovery. That quarantine, so far as children are concerned, is carried for that period of time after disinfection. The older members of the family—that is, the workers—are allowed to go after disinfection is completed; and that disinfection, I would say, is as complete as we know how to make it—by scrubbing, cleaning, and formaldehyde fumigation.

As to the State quarantine against our neighbors, Delaware established a quarantine on August 9 against New York, New Jersey, and Pennsylvania. This quarantine is absolute with children under 16 years of age who do not present at our borders a proper health certificate from their place of origin. The cases that come into our State from infected districts or those who have been suffering from poliomyelitis will be placed under rigid and strict observation, so as to prevent, if possible, any foci of infection developing in Delaware. There are rules, regulations, and instructions to our health officers and the cards that we have issued up to the present time, and if we develop poliomyelitis we will have outgoing cards issued for those departing from infected districts; those we have not issued yet, but they will be secured.

The Secretary. The District of Columbia; Dr. W. C. Woodward.

Dr. Woodward. Mr. Chairman, we have had from the beginning of the current calendar year 16 cases, of which 14 have occurred since the 1st of July. Of the 14 cases occurring since the 1st of July, 2 have been imported, 1 from the State of New York, and 1 from the State of New Jersey. Of the total number of patients 2 have died. In the year 1914 we had 8 cases. At the present time we have established no quarantine against anyone.

The Secretary. Illinois; Dr. C. St. Clair Drake.

Dr. Drake. Since the 1st day of July we have reported to the New York State Board of Health 230 cases. Each one of these cases has been visited by the district health officer and by the epidemiologist. Twenty-four of the cases have proved not to be poliomyelitis, leaving, since the 1st of July, 206 cases of confirmed poliomyelitis. There have been 18 deaths up to date, a rate of about 9 per cent.

At the present time we have 142 active cases in 76 localities, 50 of which are in Chicago. Of the cases reported in the last few weeks outside of the city of Chicago, 40 per cent are in strictly rural districts; that is, on farms, and apparently with no connection whatever between them, so far as we can ascertain, and the centers of population. Seventy-one per cent of our cases are those of children

under 5 years of age. Out of the 76 communities affected only 11 have more than 1 case.

So far as quarantine is concerned, I may say that we have had very rigid requirements for the last two years governing the control of poliomyelitis. These were amended in July because of the outbreak in New York, and made more rigid. Our period of quarantine is five weeks. We have not quarantined against New York or any other infected area. We do, however, as a matter of protection to the State, inspect the passengers on all incoming trains from the East. The Chicago health department furnishes a number of health officers to inspect all trains coming into Chicago. We require that the railroads shall report to us by wire the presence of children under 16 years of age and their exact destination. We advise the health officers as to the destination of these children and keep them under observation for a period of 21 days—not confinement, but observation. We have had but one case in Illinois that could be traced to New York, and that child left New York about July 1 and came across country by automobile, and afterwards developed the disease in Illinois 21 days after leaving New York. So far as our other requirements and quarantine are concerned, I presume that will be taken up by others.

The SECRETARY. Indiana; Dr. W. F. King.

Dr. KING. Mr. Chairman, Indiana had more poliomyelitis in 1911 and 1912 than it has at the present time. In the year 1911 and 1912 we had a rather extensive epidemic that swept over the State from northwest to southeast, and at that time the State board of health made a statement of 684 cases occurring in the State. The 684 cases probably did not represent more than 60 per cent of the actual number.

Poliomyelitis has been a quarantinable and reportable disease since 1911. Our regulations have been changed in the present epidemic. All cases are reported to the local health officer and to the State board of health. Quarantine is required for 28 days from the beginning. Local regulations are under the administration of local health officers and are outside of the rules of the State board of health.

Indiana has quarantined against no section and has no quarantine regulations, except those governing the control or attempt to control infantile paralysis within the borders of the State. I think four cases have been reported in that way.

The SECRETARY. Iowa; Dr. Henry Albert.

Dr. ALBERT. Since July 1 there have been 25 cases of poliomyelitis in Iowa. These cases have been scattered over various parts of the State, the largest number, eight cases, occurring in one locality in the northern part of the State. This is a place where we had a serious

epidemic in 1910. There was an investigation at that time. I may say that no quarantine has been established against any State or any locality.

Individual cases are quarantined, and quarantine is maintained for three weeks from the beginning of the disease. I may say that we feel that the bulletin which has been issued by the State board of health, written by Dr. Sumner, the secretary, has done a great deal to allay fear as to the disease. At the beginning considerable alarm was felt in various localities, but since the issuance of the bulletin, which has been widely copied by the newspapers, fear has been largely allayed. I may say that I have here a copy of this bulletin, which I should like to leave with the secretary. We feel that it has done a great deal in not only allaying the fears of the people, but also in preventing the spread of the disease. We are in hopes that we will not have a recurrence of the epidemic of 1910.

The SECRETARY. Kentucky; Dr. J. N. McCormack.

Dr. MCCORMACK. Kentucky does not impose rigid quarantine against any State; has never done it, even with yellow fever. We require the reporting of cases coming from infected areas and the keeping of them under observation until the period of incubation has passed.

On July 1 the regulations in regard to certain diseases, and this disease in particular, was made the subject of a bulletin which was widely distributed, and through the newspapers placed in the hands of almost every family in the State. Since then we have required the railroads, as we have always done with regard to yellow fever and other diseases, to report children of nonimmune age to the State board of health, and required the local boards to keep them under observation until the period of incubation has passed.

Up to yesterday we have had 18 cases of poliomyelitis reported this year. None were of children from infected areas, and a majority were from the rural districts. Our rules require that the cases be kept in quarantine for five weeks and the most rigid precautions taken, so far as the management of the patients themselves is concerned.

Our publication, as Dr. Albert said in regard to their publication in Iowa—and that may be emphasized by other gentlemen—has done much to allay public fear and excitement, and we feel in the main that we are prepared to deal with an epidemic should it occur, so far as our present knowledge is concerned.

There is one point that is coming up in Kentucky and has been made the subject of keenest consideration, which I hope may receive some consideration from this conference. As with some other diseases, scarlet fever and infections of that class, we have for years had

and now entertain grave doubt as to the extent to which so-called "sweatshops" in the great centers of population are the means of dissemination over the country. As is known, in the crowded tenement quarters in some of the cities, where there is not rigid inspection, it has often been found that contagious diseases exist in the rooms where clothing is being manufactured, and our fear has been that where there is not rigid supervision this avenue furnishes the greatest means for a wide diffusion of disease. I know that in some of the cities this subject has received consideration, and probably to an extent by the Public Health Service, but we have had considerable fear not only from poliomyelitis but of similar communicable diseases from these sources of contagion. I ran over from Canada yesterday. I have been out of the State for a few weeks, but I am in touch with the board every day by wire, and I am here as a student to gather information, which we all need very much, particularly as to this disease. I hope that if this fear of ours is groundless of danger from infected clothing it may be removed by the consideration which this conference may give this subject.

The SECRETARY. Louisiana; Dr. Oscar Dowling.

The CHAIRMAN. A telegram from Dr. Dowling states that he is four hours late. He will come direct to the conference as soon as he arrives.

The SECRETARY. Maine; Dr. A. G. Young.

Dr. YOUNG. We ordinarily have in Maine a larger number of sporadic cases of this disease than we have had this year. For instance, last year there were 19 or possibly 20 cases. This year, up to the end of July, we had only 1 case. That developed early in the year. Our first case since the end of July occurred at one of the seaside summer resorts, where there were about 100 guests. A child in the family came from Montreal. Possibly the infection was brought from New York, as there were two guests there from New York City. The child died on the third day of illness. The next day we had a case at the terminus of the railroad which goes up through the center of the State to Moosehead Lake, at a place called Kineo. The patient was a young man 27 years of age who had come from New York City to visit his parents. He was taken sick on the second day after his arrival, and died on the third day of his illness. There was complete paralysis of the lower limbs and almost complete paralysis of both upper limbs; one was fully paralyzed and the other not quite fully, death resulting from paralysis of the respiratory tract.

We have had no extension of the cases in either of those places. The second case I speak of was plainly brought from New York. These deaths occurred, as I have stated, on August 4 and 5. In

Portland there has been just one case. That patient is now convalescing. Two rural communities, Canton and Atkinson, each had a single case. Neither had been away from the farm homes. There was no communication and apparently no chance of contact with any infected case. Those were sporadic cases.

In the city of Rockland there have been several questionable cases; but we take care of the questionable cases just as we would those in which positive diagnoses have been made. The first case was not reported; diagnosis was not made. It was probably a case of poliomyelitis. There have been other cases since. The local board of health is doing efficient work, and I am hoping that we will have no further trouble; but because of the fact that the first case was overlooked, and for quite a number of days possibly the disease was present, some of the other summer resorts and the surrounding towns are quite panicky. Altogether we have had 14 cases this year, 13 since the beginning of August. That, I believe, is all I have to report.

I would say that we have every year a very large number of New York people who visit our summer resorts along the coast and in the interior, and I am quite surprised that we have not had a larger number of cases than we have had.

The SECRETARY. You have had a total of 14 cases for the State, then?

Dr. YOUNG. Fourteen cases altogether.

The SECRETARY. Maryland; Dr. John S. Fulton.

Dr. FULTON. The State of Maryland reports up to night before last, the 15th, that all Maryland has had 34 cases of poliomyelitis. Maryland has one and a third millions of population. There is only one large city, Baltimore. After Baltimore there is no city as large as 30,000 population, so that I simply report under those two heads, Baltimore, and Maryland exclusive of Baltimore. Baltimore has had up to night before last 13 cases of poliomyelitis. In the corresponding period in 1915 Baltimore had 25 cases. That part of Maryland which lies outside of Baltimore had, up to night before last, 21 cases, and in the coresponding period of the previous year 31 cases. For all Maryland we had, in 1915, 66 cases, and we have at this time 34 cases.

Poliomyelitis has been a reportable disease in Maryland for several years, and has been regularly named on our notification cards. We consider our notification system an excellent one. Maryland at this time has made no quarantine regulations against any State, nor has there been any internal quarantine up to the present time.

The SECRETARY. Massachusetts; Dr. A. J. McLaughlin.

Dr. McLAUGHLIN. Mr. Chairman and gentlemen, we had in Massachusetts in July 105 cases. It is going to be worse before it is better, and we will probably have 300 or 400 cases in August.

We think that we could account for most of our cases if there had never been an epidemic in New York, but certainly some part of our problem comes from New York infection. The disease is reportable in Massachusetts. The physicians of Massachusetts are reporting the cases, and in fact have overreported to some extent. Every patient is examined by one of the district health officers of the State, and some of the cases are thrown out as not being poliomyelitis.

There have been no quarantine restrictions in the State. The city of Boston and the summer resorts on Cape Cod and the south shore have very close connections with New York, but there has been very little poliomyelitis in that section. The disease has been most prevalent among very poor people, in towns like New Bedford and North Adams. It is not entirely confined to these, however, as is shown by a case reported just before I left. A young man who had just returned from Plattsburg within two days after his return came down with the disease. He was a young man of wealthy parents. It seems to me that it is a most difficult disease to control by quarantine restrictions, and as a health officer I hesitate to put on the restrictions without having some idea of the results we will obtain. As you know, in Massachusetts the State has no power except in an advisory capacity and we have advised the prompt reporting and isolation of cases. As for people from outside of the State who have not developed the disease we have recommended observation for a period of three weeks, but not detention in quarantine of any kind. However, some local communities have exercised their prerogative and have taken more drastic action in a few instances. One town, Great Barrington, I believe, will not allow an automobile to enter with a child in it; and I was told that they would not even allow an automobile to pass through the town to a town more leniently inclined. The State, however, has not taken action imposing quarantine or advising quarantine upon travelers from New York or any other State.

The SECRETARY. Michigan; Dr. John L. Burkart.

Dr. BURKART. Mr. Chairman and gentlemen, we have had since the 1st of January, 1916, 97 cases of infantile paralysis reported to the State board of health. We had 21 cases, scattered over 17 counties, up to August 10; since then we have had 76 more cases.

As a matter of record we show that in 1910 we had 104 cases; in 1911, 68 cases; in 1912, 78 cases; in 1913, 56 cases and 29 deaths; in 1914, 49 cases and 28 deaths; and in 1915, 94 cases and 34 deaths.

Michigan conducts her public health affairs on the township system. The local board of health has an absolute right to institute any quarantine measures that they see fit to impose. The State board

of health recommends what the quarantine regulations shall be. We have no authority other than in an advisory capacity, except in cases of an epidemic. We have authority to quarantine against New York or any other State if, in our judgment, such a procedure is warranted. Consequently we are making our great efforts with the township, city, and village boards of health in order to make them protect themselves and make the system self-working. We have for some time declared infantile paralysis a dangerous communicable disease; in fact, nearly a year ago I was instrumental in endeavoring to get our board to make it reportable. Of course, it is compulsorily reportable. We quarantine and isolate all persons who have been in an infected household, making provision for releasing the adults under certain conditions. The minimum period is four weeks. I will leave this map with the conference as a matter of record.

The State has not taken any severe measures relative to quarantine against outside communities. We are located very fortunately in Michigan, in that we have but two big ports of entry, Port Huron and Detroit. A circular was sent to the health officers of each of those ports early in July asking that very strict supervision be exercised over persons coming from New York or any other infected area. Michigan is a great summer resort State. We have a considerable influx of people from the West and the South, but very few from New York. We started early to make an inspection of these summer resorts. Every health officer was called into council, and instructions were given particularly against allowing persons from New York State to come in unexamined. We have not found it necessary to quarantine, as I said, against New York State.

The Secretary. Minnesota; Dr. H. M. Bracken.

Dr. Bracken. Mr. Chairman and gentlemen, Minnesota to her knowledge has had infantile paralysis since 1908. In 1908 we had an estimated number of 150 cases, with 9 deaths; in 1909 we had 900 cases, with 234 deaths; in 1910 we had 631 cases, with 201 deaths; in 1911 we had 117 cases, with 59 deaths; in 1912 we had 43 cases; in 1913, 90 cases; in 1914, 32 cases; in 1915 we had 127 cases and 26 deaths.

This year, prior to July 19, we had 47 cases; 10 of these died. Up to August 15 there were 318 cases, with 29 deaths, 271 of these occurring after July 19.

These cases are from 104 sanitary districts, i. e., townships, villages, and cities. Of these 318 cases, 35 were in St. Paul, 72 in Minneapolis, and about 30 in Stearns County.

In Minnesota the disease has been reportable since 1909, I believe. Ordinarily it is reported by the physicians to the local health officers. This year we made a ruling that it should be reported immediately to the State board of health by telegraph or telephone, so that we

could get in touch with the cases more quickly. The cases are isolated; there is not a rigid quarantine. It is our intention to follow up each case reported, and some of the reported cases have been excluded. The physicians are very good, indeed, about reprting suspicious cases, even directly, so that I think we are getting a large percentage of them. The State made an extra allowance to the State board of health for help in this work, so that we have been able to employ whatever assistance was necessary, and the university is cooperating with the board, and has just now put a man in the field with us for two or three months.

Of imported cases, so far as I remember, we have had but two. One was from Montana and the other was from Saskatchewan; so that New York is not the only place from which cases have been derived. Our cases are scattered, and some are in remote districts, and it is very hard, indeed, to determine how they originate.

We have not quarantined against any other State or against any community. The board did not consider that necessary. We think that we are wide-awake, and are helping the local boards of health.

The SECRETARY. Missouri; Dr. J. A. B. Adcock.

Dr. ADCOCK. Mr. Chairman, we have in Missouri about 3,000,000 of people. We have had reported from June 1 to August 15, 11 cases of poliomyelitis and 4 deaths. We have had a few sporadic cases of poliomyelitis each year in Missouri since we began collecting such statistics, in 1910.

We in Missouri have not become alarmed yet, and the board of health has not instituted quarantine against any State. However, we have issued instructions to the local health officers throughout the State to isolate every case of poliomyelitis.

This disease with us moves in a mysterious way. We have had 5 cases in the city of St. Louis, with a population of 750,000 people, and 1 death; 6 cases have been reported from throughout the State, 4 of them on farms in the country and 2 in little towns or villages. No secondary cases have developed. It seems as if the disease drops down sporadically here and there and all around. We have ordered and have maintained strict isolation of the patients.

Really, I am here to learn something about the disease and means for its prevention, so that when our people get disturbed their fear may be allayed. I feel that we need not be alarmed in Missouri at the present stage of the disease, and in fact I believe we have had each year for the past four or five years nearly as many cases as we have had this year.

The SECRETARY. Montana; Dr. F. A. Cooney.

Dr. COONEY. Since the latter part of June we have had in Montana 15 cases reported; 9 of them are from one point and 4 from another,

and there is 1 each from two other sources, all tributary to the starting point.

The SECRETARY. How many cases altogether, Doctor?

Dr. COONEY. Fifteen.

The SECRETARY. How many deaths?

Dr. COONEY. No deaths.

The SECRETARY. Nebraska; Dr. E. A. Carr.

Dr. CARR. Mr. Chairman and gentlemen of the conference, Nebraska has had only 10 cases of poliomyelitis since the first of the present year, all sporadic, with 2 deaths. Poliomyelitis was declared a communicable disease in 1909, and from that time it has been quarantinable and reportable. Our quarantine on poliomyelitis is 30 days as a minimum. In 1910 the disease was epidemic.

Nebraska has a State orthopedic hospital, under the direction of Dr. John P. Lord, which is giving attention especially to these cases, thus benefitting the rich and the poor alike.

The SECRETARY. New Hampshire; Dr. I. A. Watson.

Dr. WATSON. Mr. Chairman, New Hampshire has a normal record, as far as this disease is concerned. There have been during the course of the year 7 cases reported and 2 deaths. They occurred in five different municipalities representing four counties. Not one of these cases was traceable to its origin, and there could have been no connection between them and the cases in New York and Brooklyn. They were evidently sporadic cases occurring among people who had not been in the city.

We have established no quarantine against any other State. In fact, we have left our doors wide open, and to-day in New Hampshire I am speaking within limits when I say there are thousands of people accompanied by children from New York, New Jersey, and Philadelphia. Their automobiles are to be seen in all of our boulevards. Aside from that, we have many summer camps established by parties from outside of the State, located on the borders of our lakes and in our mountain region, and still not a case of this disease has appeared among any of those children.

The State board of health of New Hampshire has absolute power to establish a quarantine; it has absolute power to approve, disapprove, or dismiss a local quarantine in case a local quarantine has been established against another State or municipality; but no case has arisen that has required any action on the part of the local authorities along those lines.

I may say that this disease has been reportable for several years in the State of New Hampshire, and in the present year we have a smaller number of cases than we have had on an average during the last seven or eight years. That is practically the condition that exists to-day in New Hampshire.

The SECRETARY. New Jersey; Dr. R. D. Fitz-Randolph.

Dr. FITZ-RANDOLPH. Since July 1, when the disease appeared in epidemic form, and up to yesterday afternoon, we have had 1,740 cases reported to the State department of health of New Jersey. Allowing for a day or two for reports to reach us, it is very probable that there are at the present time in the State about 2,000 cases in 175 out of the 496 districts. All the counties are represented except Cape May County in the extreme southern portion of the State. The disease has appeared in epidemic form in those sections adjacent to New York City and is spreading over the State at the present time. The State department of health requires that children under 16 years of age coming into the State must be provided with certificates from competent health authorities. This also applies to children traveling from one municipality to another. These regulations were made, first, for the purpose of apprising the local health officials when children came into municipalities; secondly, to discourage as far as possible the unnecessary traveling of children; and, thirdly, to attempt to bring into some sort of harmony regulations which were being made by local health authorities throughout the State. People in the northern part of the State adjacent to New York were considerably alarmed, and this resulted in the local authorities in some counties establishing quarantine regulations which brought about very great impediment to travel and considerable hardship. It was largely for the purpose of attempting to make uniform those regulations that the State department adopted the present system.

The SECRETARY. New York; Dr. George Draper.

Dr. DRAPER. Mr. Chairman, the commissioner of the State of New York sends his regrets to this meeting for his inability to attend. He only ordered me down here last night, so that he was unable to supply me with the figures for the State, but Dr. Emerson, of the board of health, furnished me with the figures for the New York City epidemic up to the first of this week, and they probably would dominate the total figures of the State, so that I should like to ask the chairman to call on Commissioner Emerson to give the figures for New York City. May I, however, ask one word? Are these figures that are being given now based purely on cases of paralysis or cases which have been diagnosed by other means but are not paralyzed?

The CHAIRMAN. Gentlemen, we have here by invitation Dr. Haven Emerson, of New York City, and I suppose you would be glad to hear from him, although he is not a State official. Dr. Haven Emerson, we will be glad to hear from you. [Applause.]

Dr. EMERSON. Mr. Chairman, I suppose I may be considered the chief conspirator in the epidemic. Up to yesterday morning there

have been 6,653 cases and 1,497 deaths in New York City. Since the beginning of the epidemic we have had a large number of cases reported which were found not to be poliomyelitis, the proportion being about 20 per cent of all reported cases. I mention this to indicate the degree to which the medical profession is reporting cases which are doubtful and which need confirmation. Every case which is reported as a true case is on the basis of the visit of a diagnostician, plus a laboratory report on the spinal fluid unless paralysis is present.

The epidemic began the 1st of June. In May there were reported to us 5 cases, which is much less than the usual monthly report for the last few years. In 1912 we had reports of about 40 cases a month throughout the year. On referring back to the month of May, those cases which have subsequently been found on a house-to-house survey and through reports of physicians and hospitals, we have learned that there were at least five times as many true cases in May as had been reported up to the 1st of July. By the 7th of June the division of epidemiology had notified me that there were a number of cases, closely confined to the South Brooklyn water front, limited to the children of Italians living in that vicinity. The upper chart on the wall here represents the onset in the city from that district as a whole, and the chart below represents the onset from the five boroughs, respectively. In the right-hand chart there is shown the weekly incidence of the disease in the various boroughs of the city as a whole.

On the 7th of June I had a report from the epidemiologist of the department that there was this grouping of the cases in certain parts of the city and among a certain race. On the 15th of June mothers began to bring in children to our baby stations—so-called milk stations—with the story that for several days the baby had not been able to lift an arm or a leg. It then developed for the first time that there were many unreported cases, even in places where we were hunting for them. On the 15th of June orders were issued that the disease be given special attention, and an increased force of diagnosticians and nurses was devoted to that particular field. On the 3d of July a special act of the board of estimate gave us authority to engage such labor and help as was necessary. From that time until well on in July the epidemic was pretty well confined to Brooklyn, although of the 15 cases just now discharged after eight weeks in quarantine 4 were from the Borough of Richmond, 4 from Manhattan, and 7 from Brooklyn, so that there was an increase in other boroughs almost immediately after this occurrence in Brooklyn. The race group represented by those cases was largely the Italian laboring class.

As to the disease in the State, I have no exact figures, but I feel quite confident that the cases are well over 1,000 and that the death

rate up to the present time has been about 9 or 10 per cent in the State, whereas in the city it is 22 and a fraction per cent.

If I am not taking too much time, I shall describe in detail the procedure now in force in the city and the instructions issued to the workers in the department [reading]:

I. GENERAL INFORMATION.

1. *Incubation period.*—The incubation period of the disease and the quarantine period of children under 16 years of age who have been, but no longer are, exposed to infection has been set at 14 days.

2. *Quarantine.*—In all families where a case of poliomyelitis has occurred all the children under 16 years (except those who have had the disease) are quarantined in the home until two weeks after the termination of the case by death, removal, or recovery. The patient, whether at home or in hospital, is quarantined for eight weeks from the date of onset of the disease. No case in hospital can return home until quarantine is ended.

We arbitrarily set the period of six to eight weeks at the beginning of the epidemic for the sake of bringing a certain amount of social pressure to bear upon people who would otherwise try to keep their cases at home. We tried to hospitalize the patients as much as possible, although we had no new evidence that the disease was infectious, and we are maintaining eight weeks as the quarantine period in order to persuade people to allow us to take their cases to the hospital, because the burden of expense would be so heavy if they kept them at home.

3. *Placards.*—All premises where a case of poliomyelitis occurs are placarded, except hotels and boarding houses, where patient is at once removed to hospital, room renovated, and no quarantined children remain on premises. In private houses one placard is placed on the street wall of the house and one on the door entering room the patient occupies. In apartment and tenement houses three placards are posted—one on the street wall, one on the wall of the entrance hall, and one on the door of the apartment. All placards are dated and initialed.

4. *Removal to hospital.*—No case is left at home unless the following conditions are complied with:

(*a*) There must be a physician in attendance daily and regularly.

That applies where other than medical practitioners report a case and state that they are in charge thereof. We do not consider that as sufficient protection to the community, and we require a physician in attendance.

(*b*) The patient must have a special attendant, who must obey quarantine regulations, and must not do any housework, marketing, or perform any household duties for other members of the family.

(*c*) The patient and the attendant must have a room or rooms separate from others in the family.

(*d*) All the windows of this room must be screened, and all flies in the room killed.

(*e*) The family must have a separate toilet for its exclusive use.

That was helpful in eliminating many cases from tenements which otherwise we would have been unable to remove. We did not wish the common toilet to be available, because of the recognized infectious character of the bowel discharges.

(*f*) Quarantine regulations must be strictly observed by the patient and the other children of the family, if any. When the disease occurs in the premises of families of food handlers, the employment of such person or persons at this occupation is forbidden, unless they occupy entirely separate apartments for a period of two weeks after the removal, recovery, or death of patient.

(*g*) *Disinfection and renovation.*—The personal and bed linen of the patient must be properly disinfected and, after removal, recovery, or death of the patient, complete renovation of the rooms occupied by the patient is required.

By "renovation" we mean scrubbing the woodwork, painting and papering, and calcimining where necessary; that is, the rooms are not to be occupied again until after the same precautions have been taken as in case of tuberculosis or other infectious disease.

II. DUTIES OF INSPECTORS.

Cases are reported by physicians, nurses, social workers, and other citizens, and all are visited at once by inspectors, even those reported by physicians with request that they be admitted to hospital. Attending physicians to department hospitals may admit cases direct.

The janitor or his representative must be seen in every instance and notified that he or she will be held personally responsible by the department for keeping quarantined children in the family premises and seeing that placards are not removed or defaced.

If the inspector makes or confirms the diagnosis of poliomyelitis the borough office of the department is notified, and by it the ambulance is summoned if removal is indicated. In every case the inspector leaves the hospital admission slip, properly and fully filled out.

All cases of questionable diagnosis are seen at once on consultation with the borough or chief diagnostician, and, whenever it is required, spinal puncture is made and laboratory report submitted by the staff of the research laboratory. Cases with positive laboratory findings are considered as poliomyelitis regardless of clinical signs. A full history is recorded on a special card (Form 316–V) for each assignment covered by inspectors.

III. DUTIES OF NURSES.

Nurses visit every case reported to instruct the family regarding quarantine, and every other family in the house.

(*a*) That there is a case of this disease in the house.

(*b*) That the other children of the family in which the disease has occurred will be quarantined, and that, should they fail to observe quarantine, that fact should be immediately reported to the department of health, when steps will be taken to enforce quarantine by a summons to court.

(*c*) Regarding home cleanliness, personal hygiene, the danger of infection by flies, and other general measures which should be taken to prevent infection.

(*d*) To report at once to the department any cases of suspicious illness of children or any cases of poliomyelitis, especially if there is no physician in attendance.

A current history (Form 304–V) is kept by the nurse for every case, giving dates of visits, action taken, and date and mode of termination.

Nurses must see the janitor or his representative on the first visit and repeat the instructions given by the inspector. Patients remaining at home and families with quarantined children are visited at least twice weekly by the nurse for the maintenance of quarantine, and oftener if necessary. After removal, recovery, or death of the patient, nurses issue renovation notices, following these up by visits until complied with.

IV. DUTIES OF SANITARY POLICE.

These officers visit frequently—daily if necessary—premises in which patients have been allowed to remain, to enforce quarantine and to affix or replace placards. They serve summonses when quarantine regulations are broken and appear in court.

V. AMBULANCE SURGEONS.

All cases ordered removed to hospital must be removed without question, with the following exceptions, in each of which the ambulance surgeon must obtain authorization to leave the case at home from the resident physician of his hospital by the nearest telephone:

(*a*) When removal would endanger life of child (bulbar symptoms).

Bulbar cases may be so aggravated by the least movement, such as that incident to the removal to the hospital, that it might be thought best not to remove the patient.

Mr. Chairman, we have refrained from removing cases that were in a serious condition physically, awaiting the outcome of bulbar symptoms. If physicians can show that the requirements will be complied with, they can have the patients stay at home pending 24 hours' observation.

(*b*) When family physician can show that requirements will be met.

(*c*) Doubtful and mixed infection cases must be removed by themselves in a separate ambulance.

In every case ambulance surgeon must leave a card with parents, giving name and address of hospital to which patient is taken. If inspector has not left admission slip, surgeon must make out same.

VI. VISITORS TO HOSPITALS.

Each case may be visited twice during its stay in the hospital by a parent or guardian. If child is critically ill, the guardian or parent will be notified and will be permitted to visit daily while child is dangerously ill.

Information relative to condition is given out at the information desk in each hospital or by telephone in response to telephone inquiry from the parent or guardian.

VII. HEALTH CERTIFICATES.

All field employees must have had and be familiar with the circular of information regarding health certificates.

VIII. ALLIED, SOCIAL, NURSING, AND LAY WORKERS.

Nurses supplied by the Charity Organization Society, the Association for Improving the Condition of the Poor, the United Hebrew Charities, Henry Street Settlement, and Brooklyn Bureau of Charities, and lay visitors from various social-service organizations under the direction of the department of health make an intensive house to house, family to family survey in infected districts to find unreported cases; to verbally instruct regarding the disease and its prevention by personal and domestic hygiene, and to report illness, especially of children, and insanitary conditions.

The Metropolitan, Prudential, and John Hancock insurance companies distribute literature by their visitors who also report illness and insanitary conditions.

IX. ROCKEFELLER FOUNDATION.

Physicians and nurses supplied by the Rockefeller Foundation, under the direction of the department of health, follow up the ramifications of all reported cases of poliomyelitis, and also do house-to-house inspection, and report suspected cases.

As regards the cases in the State, the records show that there were one or two foci of infection in the State outside of New York before the city epidemic began. The two general areas principally infected by people leaving the city are the Catskill region, which was very rapidly flooded by the Jewish people, who have made this their headquarters in summer for many years, and certain parts of Long Island adjacent to New York City.

Furthermore, the boroughs most recently affected have shown that the cases developed from the boroughs earlier infected. That is the case now in Queens and Bronx Boroughs, where many cases are directly traceable to the moving of families from the older settled parts of Brooklyn. These families are now living in the least congested boroughs, the Bronx and Queens. There have been no provisions excluding people from other cities and States, and we have received patients suffering with poliomyelitis from many adjacent States, with the consent of the local health officers because the facilities for treating persons with this disease were available in the city and were not available in other places.

The issuing of certificates was undertaken for the convenience of the local health officers outside of the great cities, and there have been up to date 86,000 of these certificates granted and 348 refused. The causes of refusal to issue certificates were that people had come from premises where infection existed at the time or where people were, frankly, suffering from poliomyelitis or other temporary illness which was sufficient cause to hold them under observation. Mothers came with their children in their arms suffering with the disease, so that the certificates may have saved some few people from leaving New York with the infection. It is obvious that certificates can

serve merely as a means of identification for the health officers elsewhere and in no sense as a complete means of protection against the disease, inasmuch as the symptoms in the incubation period are absolutely nil. Therefore within two weeks of the time when an apparently absolutely healthy person may have received a certificate the disease may develop, at which time that person may have gotten as far as San Francisco. The certificates were not issued except for the convenience of travelers and as a means of identifying the origin or place of departure of visitors destined to places outside of the presumably infected city.

The campaign of publicity undertaken by the city and supplemented throughout the State by the State department of health has had important results. Parents have been warned that during the epidemic they can not afford to allow any sickness to pass without the observation of a physician, and physicians have been advised of the early symptoms of the disease, so that they may be suspicious of cases which are similar to other mild attacks of disease. They were also informed that the presence of the disease should be verified by spinal puncture or other diagnostic procedure. These were the only resources we had, with the exception of isolation or quarantining of the cases. We have isolated in New York about 66 per cent of the true cases discovered. We have in the hospitals now 2,384 patients with this disease, and of those 2,300 are in the hospitals of the health department and 300 in other hospitals.

There are two or three striking facts that have developed. One is in answer to a question recently asked. There was a strike of the garment workers in New York, lasting three months, which extended over the entire period of this epidemic and up to a week ago, so that New York has been producing in the last summer less sweatshop material than at any other time, and the people have not been working in places of that character.

We have 30,000 children in charitable institutions in New York, supported partly at the expense of the city and partly at the expense of the charitable institution. All of them are under the control of the department of health so far as quarantine regulations are concerned. We maintain a two weeks' quarantine of all children committed to those institutions. There has not been a single case among those 30,000 children in the city of New York. They have had the same water and food supply, have been accessible to the same insects, and have been subject to the same temperature and the same conditions in general as other children, but they have not been in contact with infected children. Furthermore, from the beginning of the epidemic we forbade the visiting by parents at these institutions. These institutions have been isolated in the city with 30,000 children,

as susceptible to the disease as any others, and no cases have developed among them.

Take another instance. Barren Island is the place where all the city garbage is carried by scows, handled and treated, and all dead animals are conveyed. No case of poliomyelitis has occurred among the residents of Barren Island, remarkable as it may seem. I say that because it is a place where one might expect the maximum of fly-carriage infection and the maximum contact with serious garbage conditions. These people do not go off the island much, and nobody visits them unless they have to, so that the place has been isolated, so to speak.

The Borough of Richmond has had, up to the present time, a case incidence of 2.5 per thousand, and the Borough of Queens is already as high as that. The Borough of Brooklyn has about 1.5, I think. At least it is under 2. Yet Brooklyn has had, up to the present time, 3,800 cases and the Borough of Richmond 256 cases. The borough with the widest separation of its people and the smallest number of persons per acre shows the highest case incidence of the disease; and Queens, the next most open borough, gives the next highest case incidence. The most congested boroughs up to the present time show the smallest case incidence of the disease.

The age average is 1 per cent over 16, 15 per cent under 1, 85 per cent under 5, and 95 per cent under 10 years of age.

Our last previous serious epidemic was in 1906 and 1907, and a large majority of all the children affected at this time have been born since the previous epidemic.

I am sorry I can not be more specific about the State report. Dr. Williams, who is the deputy commissioner, is detained by another appointment in New York which could not be given up, and he has asked me to make a general statement for the State. The State has not quarantined as a State against other communities, but many communities in the State which have entire independence in establishing quarantine have adopted rigid quarantine, such as those described by Dr. Randolph in New Jersey. [Applause.]

The Chairman. I am sure the delegates have been very glad to hear from Dr. Emerson, and on behalf of the conference I wish to thank him for coming here and making this very interesting talk.

Dr. Bracken. Is there any relationship between the stables in Brooklyn and the occurrence of the disease? Have you made any examination as to that?

Dr. Emerson. For two years the stables in New York have been the subject of consideration, and we have been making increasing efforts to control the collection and distribution of manure, and there is no difference, so far as we have been able to determine, between

the conditions in Brooklyn and those elsewhere. There are a good many stables among the poorer tenement sections in Brooklyn, but no more than are present in many other regions. The small vendors and Italian truck distributors, many of them, have their stables in their section. Mr. C. T. Brues assisted Dr. Rosenau in his study of the insects in Massachusetts in their recent epidemic, and his work may develop the possible insect carriers, with the entomologists who are working under the direction of the Public Health Service. No promising facts or even coincidences between insects and the development of the disease in the city have so far been discovered.

Dr. Wolff. I would like to ask Dr. Emerson, and probably there are other gentlemen present who may have had experience with the disease from which they, too, may be able to answer, if they have investigated and determined positively concerning the relationship between poliomyelitis and the presence of domestic animals, cats, dogs, chickens, and the like? It seems to me that that is an extremely important question to clear up, as to what relationship might exist in the case of these animals.

Dr. Emerson. For some years past, under the sanitary code of the city, the keeping of chickens or other animals on premises occupied by tenements has been forbidden. There are no chickens kept on the premises of these poor people, in no instance on the premises occupied by tenement houses.

As regards dead animals, there have been about eight times as many dead animals removed from Brooklyn in the last six weeks as in the corresponding six weeks of a year ago. That seems to indicate either a form of epidemic disease in animals, or a sudden change in the social habits of the people. An analysis was immediately applied to this question by the veterinarians of the department and officers acting under the Public Health Service, but up to the present time the death of these animals has not been found to be attributable in any way to disease of the central nervous system, or any increase of other disease. Many people have been killing their own cats or stray cats which they have previously harbored. In many cases, instead of throwing them in the garbage can, they have notified the police at once. The Society for the Prevention of Cruelty to Animals has cooperated, and numerous animals have been submitted to observation, but up to the present time no infection has been found among them, or any disease which is transmissible, I believe, from one animal to another. I can not speak with authority in this matter, but I believe that is the conclusion.

The Secretary. North Carolina; Dr. W. S. Rankin.

Dr. Rankin. I have had reports of about 20 cases over a period of the last two months. There is nothing unusual in the character

of those cases, with one exception. In one county there are 6 cases, and in one town there are 5 cases, and the 5 patients came down within three weeks of each other. That is the only evidence of any common origin existing between cases that I have any record of. There was one case that developed in the extreme eastern section of the State at Southport, which the health officer reports to me as having come from New York five weeks previously. That is all the information I have, and that is in a telegram. There was a newspaper report yesterday of the death of a man at Greensboro who had recently been in New York.

Last year we had 17 deaths reported, which, with a fatality of 10 per cent, would give us about 170 cases. With the single exception of the one town mentioned there is no evidence in North Carolina of an unusual occurrence of the disease.

The SECRETARY. Ohio; Dr. F. G. Boudreau.

Dr. BOUDREAU. Anterior poliomyelitis was made reportable in 1910. Our reports were quite inadequate until recently, so that I will have to give you simply totals. In 1910 there were 74; in 1911, 142; in 1912, 159 cases. This year there were 166 cases from January to August 15; 9 was the largest number of cases in any county. The largest number of cases in any month was in July, when 93 were reported. So far there have been 34 cases reported in August up to August 15. About 115 cases are now quarantined in the cities; these cases have been reported from 53 widely scattered health districts.

Lucas County has the highest number of cases, 50, of which 47 are in Toledo. In the month of July 33 cases occurred in the city of Toledo. Of the 53 health officials, 43 report single cases only, so that only 10 health officials report more than one case.

We do not enforce a quarantine for acute poliomyelitis in Ohio, but we recommend that all health officers establish such quarantine. We discourage the congregating of children. We have no rules governing the entrance of children into our State, but some of our children who have left the State recently have been interrupted in their travels, although they did not go from infected districts.

We have had excellent cooperation from the Public Health Service and from the health commissioner of the city of New York. We have received a number of children from other districts, particularly from New York, and we have kept those children under observation.

The SECRETARY. Oregon; Dr. D. N. Roberg.

Dr. ROBERG. In Oregon the statistics show that in 1910 there were 143 cases, with 54 deaths; in 1911, 55 cases, with 16 deaths; in 1912, 5 cases; in 1913, 3 cases; in 1914, no cases.

In the last 13 months there have been 3 sporadic cases. In Oregon we have no tenements or slums, as in the larger cities, and the tendency is to believe that the sporadic cases do not become epidemic.

On July 15, when we learned that San Francisco had had an imported case, we immediately tried to put into effect an inspection of all trains and railway stations. The expense of this was considerable and we found we would have to form a cooperative plan with the neighboring coast States, so that on July 15 a conference was called, at which were represented California, Oregon, Nevada, Idaho, Washington, and in addition the district of British Columbia. Representatives of the various railroads and of the Public Health Service were also present. These five States and British Columbia adopted a uniform set of regulations, a copy of which I will leave with the secretary. This system is cooperative. It does not quarantine against any particular place, neither does it tie up railroad traffic. It is working splendidly in Washington and Oregon, to my knowledge. In California, which has been using the inspection system, according to a letter which I received on August 10, they have adopted this notification system, and will probably entirely dispense with the inspection system. The notification system consists of the passenger from an infected point traveling west, filling out a card giving the starting point of his journey, date of departure, and destination, naming the city and State. This card, showing the address of the passenger, is left with the ticket agent from whom the ticket is purchased, who immediately forwards it to the health officer at the place of destination, the passenger going immediately to his home where he can be kept under observation. In case of illness of a passenger the conductor is instructed to telegraph ahead, either to the passenger's destination or to the nearest point on his line where he knows there is a health officer.

We wish to thank the Public Health Service for cooperating with regard to one of our regulations which provides for a card being sent to us from the infected district. We use the cards from them to check up the cards from the conductors.

The SECRETARY. Pennsylvania; Dr. S. G. Dixon.

Dr. DIXON. Mr. Chairman and health officers of the United States, I have very little to say. To cover a multitude of details I will refer you to a report made by the Commonwealth of Pennsylvania on the epidemics of 1907 and 1910. In those years a most intensive study was made and an investigation of the houses and all conditions throughout the Commonwealth, as well as intensive laboratory studies. That intensive study was reported in full, and those reports, if you have not secured them already, are available and obtainable by you upon request. There has been very little additional informa-

tion discovered by our department in this epidemic beyond that found in 1910.

This present epidemic began about the 1st of July, and up to yesterday we had 336 cases and about 50 deaths. The death reports do not come in, however, as soon as the case reports, because case reports are wired to the State department. Every case in the State is checked off by a State officer, or in cities of the first and second class by the officers of those cities, and no case is reported unless paralysis has taken place. Other cases, however, are studied and kept under observation.

Pennsylvania was going on in the even tenor of its way in regard to the control of this disease, as it had in other years, until we found that it was gradually creeping up on us, and we discovered that children were coming over from New Jersey and New York from infected centers. Then, upon investigation, we found a number of children came over who were infected, apparently so because of the time in which they came down with the disease. We even discovered children coming over in the acute stages of the disease. On account of our ignorance in regard to the nature of the disease, its transmission, etc., we concluded that it was better to keep infected cases out of the State, or, in other words, merely to ask the other States to do what we were doing ourselves and to inform us of conditions.

In Pennsylvania quarantine is absolute. The room or rooms in which the children are kept have all insect life exterminated and are screened. They are visited by nurses every day, or, if not by a nurse, by a competent attendant. The wage earner, however, when the disease is first detected, can be disinfected and can leave his home and remain away until after the quarantine period. This is to save the great expense that would otherwise be placed upon the poor boards throughout the Commonwealth. We have instructed individuals and the various municipalities to clean up thoroughly and to try to exterminate insect life, even insects found on animals. That was referred to a while ago. Dogs and cats are supposed to be disinfected or done away with.

I want to say that there is one thing that seems to be most important upon which we are working. There is a feeling that fly-breeding places are infected more than where such breeding places are not found, so much so that we are paying a great deal of attention to exterminating flies. We speak of the thickly populated places, against more sparsely populated ones. Philadelphia has about two-thirds of the cases. Outside of Philadelphia there are six and a half millions of people, scattered over 45,000 square miles. We have cases developing in the most remote and mountainous districts, where we can only detect communication with the outside through the United States mail and the foodstuffs and clothing received.

There is absolutely no contact with other people from infected houses. Very markedly is the fact set out throughout the entire State that there are very few secondary cases in families having two or more children. That is a fact that stands out everywhere, not only here but in New York City as well, which certainly indicates that man has a great resistance to this infection, because there is hardly a county in Pennsylvania, and there are 67 counties in the State, without one or more cases of this disease. The poison must be very widespread, and yet there are few secondary cases. We had 398 patients who slept in the same beds and ate of the same foodstuffs, and lived in the same environment so far as we could determine, and yet we had only 23 secondary cases.

Dr. Emerson has said something which I think ought to have great weight with us all, and it is very comforting for me, because I have been responsible for the quarantine in Pennsylvania. He says what we have found to hold true in the Commonwealth of Pennsylvania, that in these great institutions where they have so many children, which have been practically quarantined, there has not a single case of this disease developed.

Gentlemen, I might go on and give you all the details of our instructions and so on, but they are all printed, and if anyone desires them a postal card to Harrisburg will bring them. It seems to me that the great object of this conference is to bring about uniformity in handling this disease.

The CHAIRMAN. I want to thank Dr. Dixon for his statement, and I am sure that the conference is very glad he has been able to come here at this time.

The SECRETARY. Rhode Island; Dr. G. T. Swarts.

Dr. SWARTS. Mr. Chairman and gentlemen, of course, Rhode Island being a small State, this conference would not expect to get very much from it, but we are intensely interested in this question. The disease, poliomyelitis, has been reportable by State legislation since 1911. In 1910, during the general outbreak throughout the country, we had 248 cases and 46 deaths, and last year we had only 27 cases; so that we have the disease with us at all times, more or less. We have had in the State, since the outbreak in the middle of June, 53 cases with 9 deaths.

Our system of quarantine of those from outside the State is perhaps different from some States, and yet it is like many others which have been reported here. Rhode Island professes to be a hospitable community. There was a reverend gentleman named Roger Williams, who was ostracized in Massachusetts and came down to Rhode Island with the intention of making his home there, who was met by the Indians with words signifying "What cheer." Our system of quarantine is to receive anybody who comes, if they are able to come.

If they have poliomyelitis, they are not able to come. We do not expect inspectors at the railroad trains to be able to discover poliomyelitis upon the station platform. If people come to our State with the disease, we do not send them back. We have a proper reception for them, whether they come with or without the disease, and we give them all the quarantine, observation, and attention that the health officers can supply. [Applause.]

By our system at the present time, by the order of the board of health—and it is at my desire personally—we have trained inspectors on all trains. This requires 10 inspectors, there being two or three lines of communication by rail and several lines of boats coming from the infected places in New York. We are taking not only the names of those who come from New York, but also of those from Massachusetts and New Jersey. Our system is to ask kindly, if children under 16 years of age are in the company, "Where did you come from? What is your name and address, and where are you going?" so that we can take care of you after you get there. The only restriction we place upon persons coming into the State is this, that after they reach their destination they kéep their children separate from the Rhode Island children, so that they can not get measles from the Rhode Island children. [Laughter.] The thing has worked out very nicely, so that from the time when inspection was instituted, June 18, up to a few days ago there had been received 415 families, representing 680 children.

Immediately upon receiving reports from the inspectors we refer at once to the lists which New York City sends out from there, showing all the cases in the last 24 or 48 hours. Our clerks go through every one of those lists. In that way they determine whether persons have come from an infected house in those districts. In two cases we have found that persons came from houses of this character, but no cases of illness developed. We have had children who were taken sick within two or three days after arrival. We could not tell whether they were sick before they started, and there was no reason to consider that there was any negligence on the part of anyone along the line. When people come into the State and we are notified, the local health officer goes to the house where they locate and places a limited quarantine of two weeks. Our term of quarantine for actual cases is four weeks. We do not detain adults. We request the attending nurse or the mother of the patient to keep herself as clean as she can and not to go among other people. We have not restricted the attendance of children at playgrounds. We have thought that the restriction of children from the open air would be more deleterious than the chance of a case of poliomyelitis.

The Secretary. South Carolina: Dr. J. A. Hayne.

Dr. HAYNE. Mr. Chairman, as this disease is one that we do not thoroughly know the cause of, we determined that we would institute quarantine, it still being a reportable disease and regarded as contagious. It was placed upon the list in 1908 in South Carolina as one of the reportable and quarantinable diseases, a disease which would be put in what we would call modified quarantine; that is, we thought the patient and the attendant or nurse should be isolated, the parents and other members of the family being allowed to attend to their vocations, provided they did not see the patients or come in contact with them.

About the 3d of July we received a telegram from the Surgeon General of the Public Health Service asking if there were any cases of poliomyelitis in South Carolina. We reported that there had been none since the 1st of January. On the 3d of July we issued an order to the health officers and local boards of health to report all cases of infantile paralysis by telegraph. Of course the newspapers have published a great deal concerning the epidemic in New York, the public were frightened, and the doctors were compelled to make reports of the disease whether they wanted to or not. As a consequence we had 18 cases of poliomyelitis reported in July. These were investigated by competent authorities and verified, the diagnosis being made by the paralysis.

We did not feel at all alarmed in July, except that the cases toward the latter part of the month were a little more numerous than in the early part. In the first two weeks of the month we had 5 cases, and in the last two weeks we had 13. When I left home it was the 15th of August, and up to that time we had had 37 cases reported during the month, making a total of 55 for the State. These cases did not occur in the large cities. We have but one city of any size, Charleston, and we have had only 1 case there. Columbia has 1 case. Rockhill, which has about 8,000 or 10,000 people, has 6 cases. The only interesting feature that I see in the report is in regard to a place called Swansea, a borough that trains hardly blow at as they pass, where they have had 16 cases, 2 on the 1st of August. On going over there, I found that two children had come to the town from New York; and there being no local health authorities, I presume the notification card went astray. It never reached anybody in the locality, and no precautions were exercised. In Columbia the local health officer when he receives a card goes and spots the case and puts it under observation. In this instance in the locality mentioned containing these 4 small places there were 16 cases, and they are reporting many new cases a day, so that it is developing into epidemic form. We became a little frightened from that, and we put on this quarantine. We thought we were very negligent and lax in our State, but

after listening to the reports from other States we consider that we are very severe.

We require every ticket agent before selling a ticket to any child under 16 years old, whether from an infected district or not, to demand a health certificate, and that health certificate is pinned to the railroad ticket and taken up by the conductor and checked up by him. Once a week the health certificates are required to be sent in to the State health officer. Now, we have no quarantine against any State outside of South Carolina, but we have a very thorough intrastate quarantine; that is, it does not quarantine, but it certainly discourages travel. These children have to get these certificates before they can buy a ticket, and if they board a train with a certificate not pinned to their ticket they are put off at the next station. The consequence is that it is being made so warm for the health officer that he decided that he had better come to Washington. [Laughter.] The point is, Can we not have some uniform health certificate that will be good in one State as well as another? My friend Dr. Rankin does not require health certificates in his State, and people come from North Carolina to Columbia without them. They then attempt to buy a ticket in Columbia or other place, and they can not get it without a health certificate, so that they are unable to leave. They then get on the trail of the health officer and come down and besiege my office with a whole lot of crying children, and it is right annoying. [Laughter.]

The Secretary. South Dakota; Dr. E. B. Jenkins.

Dr. Jenkins. In 1913 South Dakota had 9 cases and 2 deaths; in 1914, 14 cases and 1 death; in 1915, 18 cases and 3 deaths; in 1916, 22 cases and 4 deaths. The cases this year are scattered over 10 counties. Seven of them are in Minnehaha County. Sioux Falls is the largest center of population of South Dakota, with about 22,000 inhabitants. All diseases are handled by the county health officers in South Dakota, and they are instructed to be extra cautious during this epidemic. The people are not alarmed over the prevalence of poliomyelitis, and there is not as much probably in South Dakota as there is in certain Eastern States.

The Secretary. Tennessee; Dr. H. H. Shoulders.

Dr. Shoulders. Tennessee up to June 30 had 27 cases. In July, up to the 22d, it had 9. There were no cases in the centers of population, all of the cases occurring in rural communities.

The Secretary. Texas; Dr. W. B. Collins.

Dr. Collins. Mr. Chairman and gentlemen, this disease has not been on the reportable list in Texas by law, but in the last year we have insisted on having it reported, and especially since the excitement began in New York. I find that we had reported in June 6 cases in 6 counties in Texas. In July we had 22 cases in 11 counties,

and up to the 11th of August, when I left home, we had 16 cases. These were all in sparsely-settled counties. None of the larger cities have been infected.

In 1910 and 1911 we had a considerable epidemic of this disease in Texas in some of the larger cities, although nothing like the epidemics reported here, but this year the cases have occurred in the outlying counties. We have a great many counties with small populations distributed over a large area. On this map you will observe that the area extends from the northern portion of the State, in the Panhandle section, as they call it, over 800 miles from one point to another. Not knowing any better way to deal with poliomyelitis than by quarantine, "modified quarantine," as one gentleman here has called it, as head of the State board of health I have isolated the patients, allowing them to be visited and cared for by one member of the family, the rest of the family being kept totally away and allowed to go practically anywhere they please. We have advised cleaning and general sanitary measures and personal hygiene, laying special stress upon mouth and nose hygiene. Not knowing how the disease is carried, by whom, or in what way, I thought to deal with it broadly along the lines indicated.

We have offered no quarantine whatever to the traveling public. The railroads have kindly assisted me in the matter, and on the 1st of June, when things began to get a little scary, organized a railway surgeon's staff, with the view of cooperating with the State of board of health in preventing communicable diseases. We were dealing with Mexico at the time, and also with travel from the East. Our railroad authorities will not sell a ticket now from any infected area in a foreign republic like Mexico or from a foreign State which is known to be infected with any communicable disease, unless the party has a health certificate. He must present a health certificate to the ticket agent. This is issued in duplicate. We issue that certificate in duplicate and the party carries one copy with him stamped by the ticket agent and the other is kept by the officer who gave it for a permanent record. That is done in dealing with the foreign Mexican population, and also in dealing with the traveling public. We merely intend to keep check on travelers and keep them located; at the same time we wish to discourage the coming of the foreign Mexican population, and we think we are doing it, with the help of the Public Health Service, the Army, the Rangers, and everybody on the border.

I do not know that I can say anything further about Texas. We have had poliomyelitis there for 30 years that we know of, with sporadic cases now and then, and we are not able to trace one case to another. It is one of the difficult problems we have to deal with. I myself have been seeing it for 30 years away out in country places

where people did not visit anybody or anybody visit them for months. Possibly it is the result of the season, but I do not know. Is it a seasonal disease, a hot-weather disease, or is it a fall or winter disease? I have not yet heard that discussed.

The CHAIRMAN. I think that will come in a little later on the program.

Dr. COLLINS. I beg your pardon; then, I will just leave that thought with you.

The SECRETARY. Vermont; Dr. H. A. Ladd.

Dr. LADD. Mr. Chairman and gentlemen, I am glad to report that Vermont has no recent cases of infantile paralysis. We find ourselves in the same condition that the epidemic sections will be in a year hence. We had our big epidemic in 1914, with approximately 300 cases in a population of 200,000 people. Only a little over one-half of our State was involved. We find cases cropping out all the time now that evidently had the disease in 1914, and we are discovering cases through atrophy and loss of function in persons who do not know when they had the attack.

In taking up our plans of active treatment in the last year and a half, starting in the first part of 1915, we secured the services of Dr. Robert W. Lovett, of Boston, the orthopedic surgeon, and his assistants, and they came to Vermont and held five clinics at different points in the State. The patients, through their family physicians, were urged to attend these clinics free of charge and have Dr. Lovett prescribe treatment or braces for them or to advise an operation if necessary. At these clinics we had patients who had been afflicted from 2 months to 70 years with all sorts of deformities, and the doctor prescribed for them at that time.

In the latter part of 1915 he came again to the same five cities and examined the patients to ascertain whether they had improved or otherwise, and just recently he has been with us for the third time. We find there is a remarkable improvement in all the cases that have followed his direction. We have two experts now traveling around the State in cars, helping the parents and nurses to care for these cases and follow up the treatment just described, and we are trying in every possible way to assist these cripples. I have in mind several patients who had been paralyzed 9 or 10 years who are now up on crutches, going to school and happy.

We have also established a research laboratory, which is under the direction of the Rockefeller Institute. Dr. Amoss is in charge and has an able assistant in Dr. Taylor. I think that is all I have to say.

Dr. MCDONALD. I should like to ask the gentleman from Vermont what the State is doing for the prevention of the interstate spread of the disease.

Dr. LADD. All children under 16 years of age coming to our State from New York are put under modified quarantine for two weeks, maintained under observation, and kept at their boarding places or homes. At the end of two weeks their noses and throats are irrigated and treated before the quarantine is raised.

The SECRETARY. Virginia; Dr. E. G. Williams.

Dr. WILLIAMS. Mr. Chairman and gentlemen, up to date the only recorded epidemic we have had of poliomyelitis was during the summer of 1908. In July of that year about 25 cases developed at and near Salem, with a population of 2,000 or 3,000. The weather was hot, and as soon as a cool spell started, the latter part of July, the cases ceased. In August another hot spell came on, and two cases were reported. There were no further cases reported. Since then we have had sporadic cases in the State, cases being reported every year and every month during that time. Last year there were more cases during the first six or seven months than in the corresponding months of this year. We have had fewer cases this year than last year.

One characteristic of these cases has been that they have been in isolated places, most of them being off the railroad. They are widely distributed over the State, some in the mountains and some in the tidewater counties. In June we had 10 cases reported from nine counties. Only one county had more than one case. During July there were 19 cases reported. In only two counties was there more than one case, each of these having two cases. We can not attribute any of these cases to importations, except one patient who came to Richmond from Philadelphia and in 36 hours developed the disease. Most of these cases seem to have developed in Virginia, and, as I say, in isolated places. In Lynchburg we have had only one case and in Richmond one; the other cases were in isolated sections.

Poliomyelitis is a reportable disease, and quarantine regulations are practically the same as for scarlet fever.

The SECRETARY. Washington; Dr. T. D. Tuttle.

Dr. TUTTLE. Mr. Chairman and gentlemen, the State of Washington had quite a severe epidemic of poliomyelitis in 1910 and 1911. A report was made on that epidemic. Since then we have had sporadic cases.

Washington this year had three cases, one of which developed in February in the family of a railroad conductor on the west side of the slope of the Cascade Mountains. In June or July another case on the east side of the Cascade Mountains developed. In addition we have had three other cases.

On the 12th of July Dr. McBride, the health officer of Seattle, was examining all passengers to determine their origin. He obtained the address of two children who arrived from Missoula, Mont., and

went out into the country about 5 miles from Seattle to visit their grandmother. On the 14th the children went berrying, a 4-year-old boy with his sister 6 years old, together with an 18-year-old boy. That night the 4-year-old boy was taken sick with stomach symptoms. We require that all these children report if they become ill in any way. The child was apparently well the next day, and the doctor said he could go out the following day. On the next day the doctor found the sister down with a typical attack of anterior poliomyelitis, and the younger child showing a slight attack. On the 19th the health officer found the 18-year-old boy who accompanied them with an attack of the disease.

No other persons have been affected, doubtless because the children were kept in absolute quarantine. I differ with some of those here to-day in regard to quarantine. I do not know how infantile paralysis spreads, and I want to quarantine just as tightly as I can, and I maintain quarantine for eight weeks. All people coming into our State are observed for 20 days after arrival. They are not quarantined. We simply take their addresses and keep them under close observation for 20 days.

The trouble with the card that is sent out from New York is that it is sent to the local health officer. In many cases there is no local health officer, and the postmaster gets it and simply chucks it in the wastebasket.

A large number of the people coming to Washington are in transit to places in California, so that we must not only watch people destined to our State but people traveling through it. Owing to our cooperation with other health authorities, we are able to do this and to notify adjacent places in California, Montana, or wherever the travelers may be going, if patients become ill.

The Secretary. West Virginia; Dr. C. R. Weirich.

Dr. Weirich. West Virginia has had 8 cases of poliomyelitis in July and August, the first case being in the city of Charleston. The cases have all been sporadic and not traceable to any outside source at all.

The Secretary. Wisconsin; Dr. C. A. Harper.

Dr. Harper. Wisconsin up to the 1st of July of this year reported 17 cases. During the month of July there were 19 cases reported. During the first 15 days of August there were 34 cases reported. Of the 53 cases in July and August, there were 6 deaths.

We have 71 counties in Wisconsin. These cases are distributed among 21 counties. The rural districts show more cases than the urban. The city of Milwaukee, with nearly 400,000 population, has 1 case. Every case is investigated by a deputy State health officer, and only those patients showing paralysis are recorded as infantile

paralysis. Two cases showing paralysis after investigation were proved to be syphilitic and were eliminated.

Our quarantine is absolute for a period of three weeks. In one family there were six children and 3 cases, and in another family six children and 2 cases. In all other families, whether consisting of more than one child or not, there has been only 1 case. None of these, apparently, has been imported. Neither is there any connection, apparently, between the cases.

In 1909 we had nearly 600 cases in about one-fourth of the State; 350 of those cases were investigated, and of these 15.2 per cent were fatal. The area covered by the epidemic in 1909 is comparatively exempt up to date.

In 1913, in the most southwestern county of the State, we had 28 or 30 cases develop from a certain center, and the epidemic at first appeared as though it were going to be severe. It started in the latter part of August and continued into September, and then, with cool weather, it abated. We have been watching that county, and up to date this year no cases have developed.

We do not inspect outsiders who come into the State, but the matter has been under consideration. The United Charities of Chicago have been in the habit of sending large numbers of children into southern and middle Wisconsin for an outing. They asked permission to do so this year. We told them after considering the matter to go on and not to wait for further orders. We do not feel that the disease is always of the epidemic type. Of course with the epidemic we had in 1909 and with the threatened epidemic in 1913, the people are much alarmed. We were freer from the disease in the first six months of this year than we were during the corresponding six months of last year—that is, freer from sporadic cases—but both winter and summer we have had deaths.

The Chairman. This completes the list of the delegates who were present at the beginning of the calling of the list. I think several health officers have arrived since we began, and the secretary will again call the roll of States, so as to give those who were not here when their States were called opportunity to respond.

The Secretary. Florida; Dr. J. Y. Porter.

Dr. Porter. Mr. Chairman and gentlemen of the conference, my experience with this disease has not been altogether different from that of the rest of delegates. Prior to the present year we had a few scattered cases in Florida each year, and aside from the epidemiological and etiological study and interest which they created, and the general sympathy which arose for parents whose children suffered from paralysis, there was nothing remarkable in the history of the disease, as far as the State board of health is aware. I have seen cases of the disease occurring in a family of six children and

only one child affected. I have seen a case arise in the city of Key West, almost the southernmost point in Florida, with not another case developing. That patient was not particularly isolated.

I have come up here to learn something concerning the disease and not to talk about something that I know nothing of, and I hope that I may get the information before I leave here.

When the disease assumed alarming proportions in the North I exercised supervisory control over the travel of children from the States of the North to Florida. About 85 per cent, I suppose, of all travel into Florida comes through Jacksonville, and the child travelers were inspected by members of my staff and by the trained nurses connected with the State board of health, the temperatures of all children being taken. It was recognized that all children have more or less elevation of temperature from travel fatigue, but where the temperature was over 100, if the destination was Jacksonville, the address was taken and the children kept under observation by competent visiting nurses for at least two weeks. That was for children under 16 years of age. Where they were destined to other towns in the State their addresses were taken and the health officer at the point of destination notified. In case there was no health officer the mayor of the town and municipal authorities were apprised of the fact that the children were coming, and they were kept under observation. So far we have had no cases reported which could in anywise be traced to importations. Of the six cases reported this year I think three can be eliminated as not being poliomyelitis, because they have been investigated, and another is exceedingly doubtful.

The other two cases are interesting from this fact, that they occurred 10 miles in the country at a little town called Perry. The family had not been away from their farm, and the first child, which was 16 months old, had not been in town since its birth. I was doubtful about the case, and sent one of my best men down to investigate. He had some trouble getting there, but he reported that the case could not be anything but poliomyelitis. Now, the interest comes from the fact that another child in the same family was also taken ill. Those are the only two cases of poliomyelitis that I know of positively in Florida in the present year. At the commencement of this excitement in New York and of hysteria in a good many other places, we requested the doctors all through the State to report promptly any cases of infantile paralysis occurring in their practice, and it is needless to say that we are going to have a great many that will turn out not to be poliomyelitis when they are thoroughly investigated. As my good old friend, Dr. Wall, of Tampa, used to say, when a disease is generally prevalent, the physicians seem to think that everything is of that particular order.

I think we are doing everything that is rational and reasonable in our State to prevent any importation, and I have no fear of the disease becoming epidemic if a case or two should be introduced.

The SECRETARY. Louisiana; Dr. Oscar Dowling.

Dr. DOWLING. Mr. Chairman and gentlemen, I have these statistics for Louisiana: In 1911 there were 16 cases in one parish—what I call a parish is what you call a county—in the northern part of the State. There were very few deaths. During that same year six cases occurred in one family. The home of the family adjoined the residence of a lady who was the wife of a banker, and this family packed their grips and started away on the first train. Less than 80 miles from home the oldest child was stricken. They went to a sanitarium, and after reaching the sanitarium the second child was taken. Those are the only instances we have had of more than two cases in the same family.

We have endeavored to keep all children quarantined, to intercept visitors, and to prevent members of the family leaving home, but we find that unless we place a guard at the premises the best of them will go and come in spite of instructions.

There were 26 cases without a single death last year. Fifty-one cases have occurred in Louisiana since the 1st day of January of this year. The large majority occurred within a few months. Of the 51 cases 4 deaths were reported. One was a traveling man from Georgia, 28 years of age. That case was diagnosed after leaving the hospital in New Orleans. When we sent a special representative to investigate it, he was somewhat doubtful about the diagnosis; but there was no question about it. We accepted in good faith the diagnosis of the attending physician.

Another girl, colored, 17 years of age, was diagnosed at the hospital as having infantile paralysis, but later several doctors wrote me and said that the girl had been injured by falling from a height of 14 feet and striking her head, and they were doubtful in their own minds whether the paralysis was due to some other cause than poliomyelitis. Eight of these cases occurred in the city of New Orleans, and I might say that they were imported, most of them, from all over the country. The other cases have occurred in the country. In one little town there were 6 cases following rapidly one after the other. Four cases were reported at one time and the other two in five days thereafter. In this same territory there were 20 cases of typhoid fever. We sent a physician in there and had the community cleaned up. What the effect of the cleaning up was we can not say, but there have been no additional cases of typhoid or infantile paralysis reported from that neighborhood. Two hundred and fifty people were immunized by the use of the typhoid vaccine.

We have had children from New York, and they are being watched closely in communities where we have a local health officer, and by

the State in communities where there is no health officer. Therefore I believe it would be well for the same parties to notify the State board of health, that it may have the local officer or somebody else interested watch such cases.

(The Secretary here completed the calling for the second time of those States for which no representative had responded.)

The Secretary. That completes the roll.

The Chairman. Gentlemen, I think we should assemble promptly at 2 o'clock in order that we may get through with our program.

(At 1.15 o'clock p. m. a recess was taken until 2 o'clock p. m.)

AFTERNOON SESSION, FIRST DAY.

(The conference was called to order after recess by Acting Surg. Gen. A. H. Glennan, chairman.)

The Chairman. In order to give Dr. Draper a chance to get away for New York we will hear from him on the symptomatology of poliomyelitis.

SYMPTOMATOLOGY OF POLIOMYELITIS.

Dr. Draper. Gentlemen of the conference, the commissioner of the State department of health of New York asked me if I would come down, owing to his inability to do so, and say a few words on the subject of the symptomatology of this disease. I imagine that the relationship between the discussion of the symptomatology and the purpose of this meeting is to make possible a better method of preventing the spread of the infection. In the first place, I think it is only fair to say that any quarantine measures which are based solely upon those cases of infantile paralysis which show paralysis are without value, because the cases of infantile paralysis which develop paralysis are much in the minority, and unless the disease is recognized in the nonparalyzed form no quarantine measures which apply only to the paralyzed individuals are adequate. Consequently it behooves all of us to observe with the greatest keenness the instances of sickness in children this summer. Now, in epidemic times we are all alive to the possibilities of sickness in children, and in the reverse of the methods of the law courts we should consider every sick child this summer guilty until proved innocent.

Now, how are we to recognize the nonparalyzed type? A few years ago it seemed an almost impossible thing to do, but as the result of the work done in various parts of the world and different sections of our country, one of the most important contributions being that from the workers in Vermont two years ago, we have gradually been learning to recognize this disease without regard to paralysis. Indeed, one of the men who was working with us down in the Long

Island foci said just before I left, "You know, I do not believe we need pay any attention to paralysis any more." That man is possibly a little extreme, but I firmly believe that before very long we shall be able to recognize this symptomatology and recognize that poliomyelitis is not essentially a paralytic disease. What are the features, then, which stamp it as a definite, clean-cut, clinical type of acute infectious disease? There are certain features of every disease which a skillful physician knows but does not quite know how he knows, and is quite unable to transmit the information to anyone else. You are all perfectly familiar with the picture of a typhoid patient. You can make a diagnosis from the foot of the bed; yet you could not describe exactly what it is you base your diagnosis on. This is true of a great variety of diseases. It is what Dr. Shattuck, of Boston, calls the "clinical hunch." It is a valuable thing, but it should not be final.

Poliomyelitis has a very definite clinical picture, but I can not transmit it to you as it presents itself. It is a definite thing, and if you see a large number of cases you will soon come to feel like the man I spoke of who, just before I left, told me that he does not think we need to look for paralysis. The cases appear as a clean-cut clinical picture of an infection that has an individuality about it. Now, what are the more definite things we can transmit from one to another in the way of recognition?

In the first place, the manner of onset. There are several very definite methods of onset. The first, and perhaps the most common, is when a child previously physically well suddenly complains of a headache, malaise, and has a temperature. Frequently just preceding the more definite symptoms of headache and pains in the bones, joints, and muscles, the child is noticed by the parent to be lying around, the usually active child being found sitting crouched up in a chair or on a sofa. He does not say anything about being sick, but there is an absence of the usual activity. The temperature is found, as a rule, at these observations to be 102° or 103°. Frequently the child is constipated and the mother gives it castor oil, and then the child vomits. There are numerous histories of castor oil followed by vomiting; and then the child seems better. There are many cases that never go any further than that. Cases with exactly the same onset picture, within 12 hours or 24 hours develop a paralysis, but a great many more with that particular onset never show further symptoms, and the thing is passed over casually as a summer upset.

Another form of onset which is fairly common is a long-drawn-out and straggling development. The child is sick and out of sorts, and with no appetite. He may have a little diarrhea, and there is usually

a history of some indiscretion in diet. It is amazing how constant the history of indiscretion of diet is, accompanying these cases. They go along five or six days with irregular temperature of 99½° or 100°, not looking like anything in particular, and then all of a sudden paralysis ensues or the cases clear up.

Then, there is another group which is becoming more and more definite as we learn more of it. Apparently it is getting to be a very frequent one, and we have dubbed it, just among the group of workers down on Long Island, "the dromedary type," because it has two humps. The case starts in much like the first group I have described, with a rise of temperature, gastrointestinal disturbance which runs 24 or 36 hours, and then the entire picture clears up. After a day of two of illness the child is up and running around, apparently as well as ever. Then after two or three days, and we have seen it as long as three days, suddenly there is headache, pain in the neck, and a beautiful picture of meningismus, with a temperature of 103° or 104°. That is a very definite group which is increasing in number as we study the disease.

Finally, there is the fulminating meningeal type, that at first sight resembles cerebrospinal meningitis so closely as to be indistinguishable. They have all of the signs of a very acute meningismus and frequently unconsciousness, delirium, and convulsions.

There are several very valuable aids to the diagnosis determined by physical examination, and among the first of these is the sign which we found quite constantly, pain on anterior flexion of the spine. The textbooks have spoken about the stiff neck and Kernig's sign in poliomyelitis, but examination will convince you, I am sure, that both of these depend apparently on the unwillingness of the patient to permit the spine to be flexed anteriorly because it is painful. When you go to bend the spine you will see the child watching the hand as you put it under the head, and he will stiffen the head and prepare to resist; in the same way if you are going to do a Kernig manipulation you will see the child get ready to resist. Some children, if you lift the shoulders or thighs, immediately stiffen back to prevent it. In other words, there is an instant and constant effort to prevent the bending of the spine. That is an amazingly constant sign in all types of the disease.

Further physical signs which are helpful are the variations in the reflexes. The knee jerks may be absent; they may be much exaggerated; they may be unequal, one knee jerk being very active and another one being absent or diminished. The cutaneous reflexes are practically always undisturbed. Occasionally one finds them somewhat disturbed, either diminished or exaggerated.

So much, then, for the physical signs. Perhaps under this heading might also be grouped the marked tenderness of muscles which also

frequently occurs, and probably, in connection with the anterior flexion pain is the cause of the child's objection to being lifted, even by its mother.

Then there is another very striking characteristic which might be grouped as in the psychic realm, perhaps—the disturbance of temperament. A usually calm, phlegmatic child becomes highly irritable, objecting to everything, a peculiar, whining, resentful irritability manifesting itself. The antithesis of this, a drowsiness or a rapid change from irritability to drowsiness, may also be present, or the child, if disturbed in sleep, suddenly whips around with a snarl and a jerk of the shoulder. All of these things are difficult to describe in words, but they form a very definite clinical picture which belongs to this malady.

Now, the other group of aids in diagnosis are the clinical laboratory procedures. Examination of the blood is of some value in connection with other symptoms, but not alone. In a large number of observations it was found that leucocytosis was the rule. In previous epidemics a leucopenia had been described, but the best evidence up to date apparently shows that leucocytosis is the rule and that the polymorphonuclears are increased at the expense of the lymphocytes. This belongs to infectious diseases in general and does not help to a differential diagnosis from spinal meningitis. Of great assistance in diagnosis, however, is an examination of the spinal fluid, and here we have a real and conclusive help in the vast majority of cases; but we are finding that it must be used with certain definite regard to the stage of the disease. In the fulminating type the fluid appears as slightly hazy, and may or may not be under pressure, containing as high as 2,000 or 3,000 cells per cubic millimeter, down to as low as 10 or 15. These cells in the very earliest stage—and by that I mean within four or five hours from the onset of symptoms—are of the large endothelioid multilobed type, with a smaller number of lymphocytes. As the disease progresses, the appearance of the cells changes and the larger cells give place to the small lymphocyte type, so that we have almost 100 per cent small lymphocytes. The globulin is usually low or negative, but within the first day or two the globulin content increases rapidly, and then within 24 hours you have a fairly heavy or very heavy globulin reaction.

In our recent work we have found several interesting things in regard to the spinal fluid. The first of these is just merely a corroboration of the work done by Dr. Fraser in the Vermont epidemic. The spinal fluid in many cases at the very outset of the disease—that is, within a few hours of the first symptoms—gives no indication at all of the character of the infection. Certainly, if you make your lumbar puncture within four or five hours, the spinal fluid is likely to show nothing at all, but if you repeat the lumbar puncture within

16 or 24 hours the cell count may be very large. We have had several very extraordinary instances of the value of following the disease by repeated punctures. For instance, a case comes down in a family where there is another patient. I am describing now an instance that occurred last week. One child was down with the disease and another boy became ill. A puncture was made within two or three hours of the onset, which indicated no change in the spinal fluid. Then after 12 hours another puncture was made, and there was a marked increase of cells. In this instance there was a question whether we should use the serum of a recovered case. The cell increase was not above 100, so that it was decided to wait and puncture again. At the end of a second 12 hours another puncture was done, and the fluid was found to have returned to normal. The following day the temperature was normal and the child was up and about as usual. If those punctures had not been done the case would not have been called positive and that boy would have gone about spreading the disease. Since this instance developed we have had another case in which multiple puncture has demonstrated its value. It seems to me that State health officers can perform no more worthy function than to urge the profession at large to use lumbar puncture, particularly as it is a perfectly harmless procedure and very easily carried out. This will mean the recognition of many cases at a time when they are most dangerous to the community.

Now, I have not said anything about the paralysis, and I do not propose to do so, because I do not want to leave, any more than is avoidable, the impression in the minds of this gathering that the paralysis is important, except to the individual. As I understand it, this is a meeting to discuss means to protect the community at large, and the way to protect the community at large is to recognize the cases which are a menace. The paralyzed case automatically ceases to be a menace with the onset of paralysis. The early recognition of cases is possible, and essential; the quarantine of paralyzed cases alone is inadequate. [Applause.]

Dr. Frantz. May I ask the doctor how long the tenderness of the spine lasts?

Dr. Draper. The tenderness of the spine may last a long time. It varies greatly in different individuals. I have seen it last as long as a month; but the tenderness of the extremities is more apt to outlast the tenderness of the spine.

Dr. Frantz. What proportion of these cases have paralysis?

Dr. Draper. We are very much impressed with the large number of cases that do not have paralysis. We have surprisingly few.

Dr. Emerson. They are uncommon.

Dr. Draper. In the rural districts paralysis has been surprisingly uncommon. The only case I have seen is one, I think, of syphilitic infection.

Dr. Wolff. I should like to ask the doctor if he has made any investigation as to the change in the reaction of the spinal fluid in the progress of the disease; that is, whether the normal outline of the spinal fluid on puncture is changed during the progress of the infection.

Dr. Draper. We have not made any observations of that nature.

Dr. Wolff. I have found that extremely characteristic in spinal meningitis in a large number of cases; that is, in the course of the disease the outline of the reaction of the fluid becomes more and more acid as the disease progressed toward a fatal termination, and I think it is a very important thing to-day to determine.

Dr. Oppenheimer. There have been a number of operations in Brooklyn and New York. What has been the position of the operated cases in connection with new cases? Has any notice been taken of that?

Dr. Draper. Do you mean in regard to their infectivity?

Dr. Oppenheimer. Yes.

Dr. Draper. I have no statistics on that. To answer your question directly, the virus retains its infectivity.

Dr. Oppenheimer. It retains its infectivity?

Dr. Draper. Yes. There have been cases in which the virus was active five months after the disease; and in one other case, which is not quite clear because of the fact that the individual may have had two attacks, at a period of two years following the first attack it was active.

Dr. Swarts. Did I understand the doctor to say that the virus was noninfective after the case was cured?

Dr. Oppenheimer. No, sir; by no means.

Dr. Draper. There is only one instance which I have reported, and in that case it was not certain that the first attack had been of the same disease.

Dr. Fulton. What per cent of your cases, or those in New York, have occurred in the colored race?

Dr. Draper. I will have to refer that to Commissioner Emerson.

Dr. Emerson. Up to the last three weeks there were so small a number of cases among colored people that we suspected that there was a racial insusceptibility to the disease. Since then they have been coming in so rapidly that it is apparent there is no difference in New York between the colored people and other groups.

Dr. Young. I should like to ask Dr. Draper if he will tell us whether the early changes in the eye reaction are of any help in the diagnosis.

Dr. DRAPER. Do you mean the pupillary?

Dr. YOUNG. Yes; the pupillary.

Dr. DRAPER. The pupillary changes we have seen have been only in connection with other changes, and I have never observed any changes in the more usual types of disease.

Dr. COLLINS. Are you sure about the immunity offered by an attack against subsequent attacks?

Dr. DRAPER. All the evidence so far seems to point to that fact, and also the fact of the high neutralizing power of the blood serum of people who have the disease upon the virus. This has been demonstrated in a certain number of people who have had the disease, and it has also been demonstrated in a number of individuals who have not had the disease. Now, whether that neutralizing power depends upon a previous attack which has not been recognized has not been determined, there being no way of deciding, but the fact that there have been reported only two possible cases of a second attack is rather significant.

Dr. PARLETT. Has any investigation been made involving the milk supply of infected families? The reason I ask is because in isolated cases there is apparently no means of tracing their origin, and I thought perhaps an infected udder or something of the sort might be responsible.

Dr. DRAPER. There is no evidence that cattle are subject to the disease. The rôle of milk is apparently associated with the milk handlers, if milk has anything to do with it.

The CHAIRMAN. I will ask Dr. Frost to speak to us on this subject.

Dr. FROST. Dr. Draper, it seems to me, has succeeded admirably in the difficult task of giving a clear clinical picture of the disease. I think he has succeeded better in presenting a picture of nonparalytic poliomyelitis than anyone I have before heard attempt it. Wickman, in Sweden, first distinctly called attention to the concurrent occurrence of nonparalyzed with paralyzed cases, showing all grades, from slight, transient paresis down to the cases Dr. Draper has described. Physicians generally have been very reluctant to admit their existence. They are quite reluctant to admit the possibility of a diagnosis on what appears to them such slight evidence. I think there is a growing tendency to get away from that skepticism and to agree heartily with the diagnosis which was proved, even prior to the proof now furnished by lumbar puncture, which thoroughly establishes the lesion.

As to just the part that these cases play in an epidemic, and as to their proportion to the paralytic cases, I think that is very much a matter of conjecture. Speaking from such experience as I have had personally, my first impression is that the proportion of nonparalyzed cases seen in any community is dependent upon the thorough-

ness with which one studies the community. In a community where you become acquainted with all the physicians and see all the cases, making practically a house-to-house inspection, you find a relatively large proportion, often more than double the paralyzed cases. I am inclined to believe, however—and I think it will eventually be proven—that, even aside from the thoroughness of the study, there is in different epidemics a difference in the proportion of nonparalyzed cases which come up over the border line of clinical recognition. Where you have a large number of cases affecting a large proportion of the population with severe symptoms you have a relatively large proportion of light infections clinically recognizable. On the other hand, where you have a thin, scattering epidemic, as, for instance, in Cincinnati, where there were but 100 cases among 400,000 people, light infections fail of discovery.

Just one word as to what effect this should have on our consideration of the prevalence of the disease. Take the case of other people being in the same family with paralyzed cases. I have some figures from an epidemic in Iowa. If we count only the clearly paralyzed cases, 5½ per cent of children under 15 associated directly with paralyzed cases subsequently developed frank paralytic disease. If we count in the clinically recognizable nonparalyzed cases the percentage was almost doubled. If we count in also the cases regarded as suspicious but which could not be examined at the time, this would again have the effect of doubling the 11 per cent to 22 per cent, giving an apparent contagiousness on that basis approximating that of scarlet fever or diphtheria. In other words, by including all cases we have quadrupled the number infected and have brought poliomyelitis up to the appearance of a contagious rather than a rarely contagious disease.

As to the possibility of recognizing these cases by general practitioners, I think a great deal more is being done now than a few years ago, and I believe such cases will be more generally recognized in another few years. It would seem at present, viewed from a public-health standpoint, that we should not wait for final diagnosis at all, but that we should isolate all cases of illness in children simply on suspicion. If we wait for a definite diagnosis, we may have to wait several days. Lumbar puncture is not going to be practiced generally in rural communities, and the doctors must isolate on suspicion. [Applause.]

The Chairman. If there is no more discussion, we want to proceed to the subject of the prevention of the interstate spread of poliomyelitis, and I will ask Senior Surg. Charles E. Banks to address us on that aspect of the problem.

PREVENTION OF THE INTERSTATE SPREAD OF POLIOMYELITIS.

Dr. Banks. The work which the officers of the service are doing is performed by a system of notification and inspection of the children departing from New York City. This is being accomplished by the aid of the health commissioner of New York City, who has established a system of district health offices where residents desiring to leave New York City apply for certification as to whether their premises are free from poliomyelitis. The traveler then comes to the depot or ferry, the children being then certified as apparently well. A duplicate of the card issued to the traveler is mailed immediately to the health officer of the town to which he is destined. That gives the health officer an opportunity of locating these people on their arrival and taking whatever measures he deems necessary for their isolation. We have now 36 officers stationed at the various depots and ferries in New York City, on what I might call the "two-platoon" system, working 13 hours a day. We also take care of such automobile travel as we can reach, and we can reach everything except travel going north into northern New York or into eastern Connecticut. Wherever they cross by ferry we are able to inspect them, the same as we do travelers by train or by boat.

We are also covering every boat exit from New York. While I am aware that there are many avenues of escape from Greater New York, yet I think we get a very large proportion of travelers through the aid of the railroads, which have issued definite instructions under the existing quarantine regulations to allow no one to board a train or a boat without our certificate. That our system is sufficiently close we have ample evidence, because of the complaints of travelers who are unable to get through without our certificate—passengers who come very late at night or early in the morning. In fact, one of the great values of our work is through the cooperation of the railroads, and I wish to express my appreciation of their conformity to the requirements. I do not know that there is anything further that I can say, but I shall be very glad to answer any questions as to our methods. I see you have said here all travelers under 16. We have certified so far about 30,000 children and about 17,000 adults. In explaining this fact, I would say that these adults request this certificate from us for the purpose of enabling them to travel. We do not require it, but many adults insist on taking it, so that they will not be held up at towns or cities where a very close quarantine is established.

This plan has been in operation since July 18, and we are certifying about 1,500 children a day. They are examined by our officers, and quite a number of cases have been turned back on account of

apparent illness. A health officer getting a notification from us can be assured that the premises occupied by the traveler are free from poliomyelitis, and that in entraining or embarking on a boat the child is apparently well. Beyond that we can not go, because undoubtedly many cases will get by us in the incubative stage, and the best we have been able to do is to give the health officer an opportunity to locate the travelers from New York City.

Dr. FRANTZ. I understand you are from New York?

Dr. BANKS. Yes.

Dr. FRANTZ. You send the notice to the health officer of the district to which the party is going?

Dr. BANKS. Yes.

Dr. FRANTZ. I would like to increase your labor 50 or 100 per cent by having you send your notices to the State boards of health of the respective States, unless they go to cities which are large cities, over 10,000 or 20,000 population. There are many small districts where there are no health officers and no local boards of health, and persons who go there escape entirely the observation of any State health official.

Dr. BRACKEN. I would like to reduce the work of your board about 90 per cent by asking you to make all of your reports to the State health officials and not to the local health officials. We know our local health officials, and we know whether they are efficient or not, and if all those reports came to us it would be for us to see that they should go to the different points in the State. I know that notifications have come into my State, but I have no information concerning them. Now, I am the man who ought to know. I ought to be in position to give the information to other sections of the State, and I make the request that all of these notifications go to the State health officer, and that he be left to distribute them to the local health officers.

Dr. TUTTLE. I would like to duplicate the request of Dr. Bracken. I would say that I do not know that a card has come into the State of Washington, yet we collect 25 to 35 passengers there every day, children and adults combined. We require a report on all. Yet I have never heard of a card coming. If they were sent to me I could have my officer do as I tell him, as we have telegraph and telephone facilities in Washington.

Dr. BURKART. I want to indorse what Dr. Bracken says. Officially we are not cognizant of any person in Michigan who came from New York. By accident, yesterday I saw one of your cards. It came to the health officer of the city of Lansing. It was the first intimation I had that you were adopting that method.

Dr. DRAKE. Mr. Chairman, I wish also to indorse what Dr. Bracken and the other gentlemen have said. We are advised occa-

sionally of persons coming into Illinois from New York. We have no official notification of it, however, and only recently I took occasion to issue an additional order that all persons arriving in the State of Illinois with children under 16 years of age shall make their presence known to the local health officer within six hours after arrival, the local health officer being obliged to notify the State board of health. I think that we could get down to this a great deal better and a great deal more efficiently if the notification were sent not only to the local health officer, but if a carbon copy of it could be sent to the State board of health. If a carbon copy is sent to the State board of health we will have it as a record. There will be some saving of time if it also goes to the local health officer, of course. In many of our communities in Illinois we have not an efficient health organization. We have the butcher, the baker, and the candlestick maker constituting a board of health. They know nothing about the handling of these cases, really, after they do get a notification, and I believe that the service can be made very much more efficient if we can get a notification to the State health officer as well.

Dr. Carr. Mr. Chairman, it seems unanimous, and Nebraska wants to second the motion of Dr. Bracken that this be done hereafter.

Several Members. Second the motion.

Dr. Bracken. Mr. Chairman, I do not want to concede the amendment suggested by Dr. Drake, that a carbon copy should be sent to the State board of health. I want the original sent there.

Dr. Drake. If the carbon copy goes to the local health officer, you will get the original. Either way.

Dr. Roberg. We have, with British Columbia, thrashed this whole thing out. We agreed on the regulation, and we put the proposition up to the railroad people, and they willingly indorsed it and put it through. If I am not out of order, I would move to refer this question to a committee, so that this whole matter may be thrashed out and presented in good form.

The Chairman. The Chair thinks that is a good suggestion. I will ask Dr. John S. Fulton, of Maryland, to discuss this matter.

Dr. Fulton. Mr. Chairman, I did not rise for the purpose of opening the discussion at all, but I am exceedingly interested in it, because it strikes me we have gotten very close to the kernel of our difficulties. I wish to call your attention to the state of confusion in which we all are at this time. We are all setting afloat throughout the United States, more or less, in the hands of passengers on railroad trains, a number of certificates of all kinds, and permits are being issued with apparently no official designation. Such, indeed, is the case of a very large proportion of them. I understand that those

issued by the Public Health Service have official designation in the State to which the traffic is going, but in general they are a very small part of the certificates and permits afloat, which are sometimes of questionable authority and often of no authority whatever. There is a situation of the greatest confusion.

We have discussed this matter in Maryland very carefully and with some solicitude, since Maryland, Delaware, and West Virginia are now in a sense the barrier States, and the question has been put up to us, What shall we do? In Maryland, I think we are very clearly of the opinion that the prevention of the interstate spread of the disease is the function of the Federal Government, and that we ought all to be relieved of State duty in the matter of interstate communication. That is our opinion in Maryland. At all events, it is a situation out of which order must be evolved.

If I have your permission I should like to make a motion that a committee on the prevention of the interstate spread of poliomyelitis be formed by this conference at as early an hour as is practicable.

Dr. COLLINS. I second the motion.

The CHAIRMAN. Is that acceptable to you, Dr. Bracken?

Dr. BRACKEN. That does not apply to my motion.

Dr. FULTON. I did not understand that there was a prior motion. I did not understand that Dr. Bracken made a motion.

The SECRETARY. The motion of Dr. Fulton is that a committee be appointed on the prevention of the interstate spread of poliomyelitis.

Dr. FULTON. Of five or three, I should say.

The CHAIRMAN. Is there a second to that motion?

SEVERAL MEMBERS. Second the motion.

Dr. DRAKE. Before you put that motion let me ask this question. Does this apply only to health certificates originating from travelers from New York?

The CHAIRMAN. It applies to every State.

The SECRETARY. As I understand the motion made by Dr. Fulton, he wishes a committee appointed to which shall be referred all matters relative to the prevention of the interstate spread of poliomyelitis, either from New York or from any other place in the country.

Dr. FULTON. Yes; that is right.

Dr. EMERSON. I submit we shall be leading ourselves into a sanitary inconsistency if we discuss this from the point of view of children under 16. Although Dr. Draper did not refer to it, and it has not been spoken of yet particularly here, it is quite obvious that there are adult carriers. It is perfectly certain that there are people who have been in constant personal contact with active cases of the disease who are due for an undetermined period to carry and spread the infection. There have been a sufficient number of cases within the

city of New York to make it quite apparent that the only obvious means of communication of infection to new foci has been through adults who have come from immediate, persistent personal contact with cases of the disease.

That is the condition we have found within the city; and yet I quite agree with Dr. Banks when he said he felt that their activity should be limited, at least in the beginning of this system, to certification of children under 16. If you do not limit yourself to that, you will find yourself facing the immobilization of your adult population. There are 500,000 people in New York City who travel from New York to other States once every 24 hours. The suburban traffic of New York would then be subject to the limitation of certificates every time such persons went from the Borough of Manhattan to their homes in Connecticut or in New Jersey. I do not want to predict or foreshadow the conclusions of the interstate committee, which will doubtless be conservative and consistent, but it is obvious that we are going to leave many holes in our armor of protection if we do not include adult carriers. Whether or not those adult carriers have suffered from the disease themselves, it is perfectly apparent that adults who have been in contact with cases may spread and have spread the disease during the present epidemic. We have not felt, however, that we had any right to put our finger on a healthy adult, and say, "You must be limited in your movements." Until we have tested their capacity for carrying the disease I do not believe we shall be able to establish consistent sanitary regulations.

Dr. Collins. I should like to suggest, in order to avoid all error, that Dr. Emerson be made a member of that committee.

The Chairman. Dr. Emerson is not an official member of this conference.

Dr. Collins. Let us make him so, ex officio.

Dr. Emerson. Other members of that committee have all the information that I have, and it would be most improper, it seems to me, for a city official to be put in that position. They have all the information in their hands, and I should beg to be excused from that; not that I am not willing to work, but I do not think that this is either necessary or proper.

Dr. Bracken. Just a moment, on the motion. I want to favor this motion of Dr. Fulton's, and probably my remarks are not necessary here: but it is possible that in putting this motion it will not be necessary for me to put another, so I will let the thing go as a motion now and then make my motion later if I want to.

The Chairman. The motion is that a committee be appointed on means to be taken to prevent the interstate spread of poliomyelitis. That is your motion, I believe?

Dr. Fulton. Yes.

(The question was taken, and the motion was unanimously agreed to.)

Dr. BRACKEN. Now, Mr. Chairman, I want to call the attention of this conference to the fact that about 1910, I think, there was an arrangement by which reports were to be made from State to State of cases. Those reports have been made by some States, and have always been forwarded to the State health officials. Therefore I move you, as bearing on this one point, that from this time on all reports bearing on this subject be forwarded directly to the executive officer of the State board of health. This has nothing to do with the situation on the Pacific coast, but it has simply to do with those reports which are coming in to the States—that they should in every instance go to the State health officer.

(The motion was seconded.)

Dr. BANKS. I think there will be no question about this. We can as easily mail these notices to the State officers as to the local health officers. We have been mailing them to the local destinations of the travelers, and we can as easily arrange to send them to the State health officers, so that it is not an addition to my work but a lessening of it.

Dr. TUTTLE. Would it add materially to your work if you turned those notices over to the telegraph company and asked them to wire them at our expense?

Dr. BANKS. Where are you located?

Dr. TUTTLE. In Washington. We are willing to pay for the telegraphing.

Dr. BANKS. I presume the telegraph office would take those dispatches.

Dr. TUTTLE. I have a frank from the telegraph company authorizing me to send any telegram direct to my office.

Dr. WOODWARD. I move that the question on the motion in reference to prevention of interstate communication be referred to the committee on interstate measures. We have a long and busy program, and that is a matter that must be considered at length.

The CHAIRMAN. Without objection, it will be referred to the committee on interstate measures. Next on the program is "The research problems in poliomyelitis." I should like to call on Dr. Lavinder to speak on that subject. Before Dr. Lavinder begins I should like to say that there are a number of railroad men here who would like to consult with the members of the committee on interstate features when they are ready to talk with them. I suppose that committee will be appointed a little later.

RESEARCH PROBLEMS IN POLIOMYELITIS.

Dr. LAVINDER. Gentlemen, I have very little to say. Such work as we have done is by no means in such condition that we are ready to present results. I think it should be made clear to this meeting, however, the exact position the Public Health Service is occupying in this epidemic in New York City, since I do not think it is generally understood. There are two groups of officers of the Public Health Service at work in New York City. One small group, of whom I happen to be the senior, is associated with me, and is entirely engaged in scientific work. The other group, under Dr. Banks, is entirely engaged in interstate notification measures.

The group of officers with which I have been associated have changed their plans somewhat—they have been forced to—several times. There are, of course, two sides to any scientific investigation. One is the laboratory side and the other is the epidemiologic side. Originally, I do not think we all realized what an immense epidemic of poliomyelitis we had to contend with, and we had planned to do certain laboratory work in New York; but when we realized what we were dealing with this laboratory work was very largely shifted to the Hygienic Laboratory here in Washington, under Dr. McCoy, and since that time we have done very little laboratory work other than to cooperate with Dr. McCoy in securing certain material for his use.

We have also taken some interest in two other matters through the cooperation of Dr. Emerson and his department and working with him. We have been doing a small amount of entomological investigation. Dr. Emerson has one or two entomologists in his department and we have one, and these gentlemen have recently begun some surveys, practically nothing more.

In addition to that we have also taken into consideration sick and paralyzed domestic animals, and have made investigations into that subject, and with Dr. McCoy will continue them.

The biggest part of our work has been epidemiologic in character, and through the kindness of the commissioner, Dr. Emerson, whom I wish to thank, for he has been most courteous, we have been able to go into the city department of health's office and obtain all of their data. At present we have men in Dr. Emerson's office who are collecting the data he secures, and we are trying to tabulate and make use of that data in a study of the New York City situation. In addition we have taken the whole of Staten Island, and are engaged in an intensive epidemiologic study in that section. We selected that borough because it presented many features of interest and was favorable from an administrative standpoint, it being manifestly impossible for us to do this work in such congested districts as parts of Brooklyn and Manhattan.

Then, finally, we have broadened our work, and through cooperation with certain State health officers surrounding New York City, in Connecticut, Rhode Island, and Massachusetts, we are getting reports of all their cases, and have detailed officers in two or three of these States to make intensive studies of certain selected cases or selected sites. When we get all of this data together and correlated, as it can be, with other observations as to poliomyelitis in the United States, we will have an immense amount of material, and we believe such observations may show something well worth while.

In connection with our outside studies I think it is a matter of some importance that I should say to the State health officers that in doing their work I think some effort ought to be made toward uniformity of statistics collected. If some arrangement of that kind could be made it would be of great advantage. For example, when you are collecting statistics with regard to age incidence, if every State could agree to certain years, instead of one State taking the years from 3 to 5 and another from 1 to 5, the statistics would be of far more value. Statistics when gathered in that way are not comparable.

In the States in which we are working we are trying to get such data compiled so that we may have figures which can be compared. I have with me three or four blank forms which will show you just what we are using, both in our case cards and the epidemiologic studies. This blue card is the one used by Dr. Emerson in his department, and this white card is the one on which we are obtaining our data from his cards; in addition we have two case cards for much more extensive work, one of which was adopted by a conference of this kind in 1911, and the other has been modified somewhat and is more extensive in certain particulars. This one is being used in the work in New York now.

The Chairman. I will ask Dr. G. W. McCoy, of the Public Health Service, to open the discussion. Dr. McCoy is director of the Hygienic Laboratory of the Public Health Service.

Dr. McCoy. Our laboratory work is being carried on in a general way in accordance with a plan outlined at a conference which was held in New York, at Dr. Emerson's invitation, on August 3 and 4.

It was agreed that the important things to do were to determine the relation of paralytic diseases of animals to poliomyelitis, to determine the susceptibility of laboratory animals and domestic animals, to endeavor to cultivate the organism, and, if possible, to devise some better method for detecting the presence of virus than the one we have now, namely, the inoculation of monkeys. Insect transmission experiments are also contemplated.

Our own work is just starting, and there is nothing to say about it at present.

The SECRETARY. Mr. Chairman, it seems to me that the conference should take advantage of the suggestion that was made by Dr. Lavinder—that is, in regard to a uniform method of collecting statistics concerning poliomyelitis—and I will therefore move that the Chair appoint a committee of five to make a report to the conference on uniform methods of collecting statistics regarding poliomyelitis.

Dr. RANKIN. Mr. Chairman, I will ask Dr. Rucker if he could not enlarge his motion to include the submission by the committee of standard epidemiological forms for obtaining these facts?

The CHAIRMAN. That is what I understood the motion to be.

The SECRETARY. Yes.

Dr. CARR. I second the motion of Dr. Rucker.

Dr. WOLFF. Why not let this apply to all these matters?

The SECRETARY. I am afraid that would be too broad.

The CHAIRMAN. It has been moved and seconded that a committee of five be appointed on uniform methods of collecting statistics regarding poliomyelitis.

(The motion was seconded, and there were cries of "Question." The question was thereupon taken, and the motion was agreed to.)

Dr. BRACKEN. Mr. Chairman, I make the following motion: Moved, that a committee of three be appointed on measures to be taken to prevent the spread of poliomyelitis in the respective States. That would be intrastate. It may be the same committee; it is immaterial to me. These committees ought to be appointed right away, and ought to have some sort of report for us very soon.

The CHAIRMAN. It is moved and seconded that a committee be appointed on measures to prevent the intrastate spread of poliomyelitis.

Dr. BRACKEN. That this be referred to a committee to take up both interstate and intrastate matters.

The CHAIRMAN. If there is no objection, that will be done.

Dr. DRAKE. If it is not amiss at this time, I should like to offer a suggestion that Dr. Rucker be a member of the committee on interstate forms. I offer that suggestion because I know that Dr. Rucker will be of great help and value to that committee.

The CHAIRMAN. I think Dr. Emerson would like to say something about this.

Dr. EMERSON. I must apologize for getting on my feet again, but there are certain research studies under way which I think you might be interested in, because others might succeed where we have failed.

Because of the discussion in regard to milk, and owing to the fact that the New York City milk supply is entirely pasteurized, it seemed to us worth while to take one borough and study every case in that borough as if it were a case of typhoid fever, to determine if there is any conceivable and detectable connection between persons on the milk farms up State from which the supply is obtained

and the presence of cases of the disease in the city. That study is being made in the Borough of The Bronx, and will supplement the studies of the Public Health Service officers in the same borough. We can ascertain from our records the source of the milk for the past month and we can locate the milk that was delivered to any particular case. This is an attempt to put an end to all doubt as to the possibility of this source of infection.

Then, through the Rockefeller Foundation fund, a study has been made as to the effect of secondary contact in the epidemiology of the disease. Dr. Doty, with the assistance of 25 or 30 nurses, five doctors, and the necessary office force of clerks, has been following the cases as they are reported each day, and up to the present time they have brought in a tentative report showing that in 30 per cent of the cases they find an obvious previous contact with an active case. Whether or not this figure will be maintained, we are not sure. These investigators go to the house and ascertain all of the people the patient has been in contact with for some days previous, and just where the child has been; in this way they also dig up a few previously undetected cases.

Then there are clinical studies conducted in the hospitals to see if we can get any light at all upon the type of children who are susceptible to this disease. As you have heard, the incidence of secondary cases is about the same as the incidence in scarlet fever. We have worked that out ourselves. For the first 2,000 cases in Brooklyn the incidence of secondary cases in the main is almost identical with the incidence in scarlet fever in the same borough among the same type of people. So that we must consider how far we may possibly detect clinically the susceptible types of children. Anybody who goes through a hospital such as Willard Parker Hospital, with 900 children, will get an impression that these children are different physically from other children. That study is being made for the purpose of helping the clinical work.

There is only one other study that is going on, and that is an investigation of the results of different therapeutic procedures. Publicity has aided us in getting a very large amount of blood from recovered cases, both those recently recovered and those where the recovery dates back 30 or 40 years, and the serum from such cases is being used in the spinal canal, after withdrawing the spinal fluid. The results will take months to work out. Let me warn you that there are no reliable conclusions at the present time. We have many patients apparently severely ill who clear up almost miraculously by being allowed to stay in bed 24 hours. On the other hand, cases of bulbar involvement have recovered after the use of the immune serum, whereas we expect to see those go on to complete respiratory

paralysis. We are doing our best to use the clinical material as it comes in for controlled clinical observations of these cases.

I can not sit down, Mr. Chairman, without expressing my thanks personally for the very great courtesy and discretion shown by Public Health Service officers. If any health officer wonders whether he is going to be accused of crying for help if he calls upon the Public Health Service, my experience is that if there is one thing that will add to the confidence of the community in the work being done it is the character of work and the character of personal relations of the Public Health Service officers. What the Public Health Service has done in its work for us has been splendid. [Applause.]

The CHAIRMAN. Thank you, Dr. Emerson; to have been of service is most gratifying.

COMMITTEE APPOINTMENTS.

The committee on uniform methods of collecting statistics regarding the spread of poliomyelitis will consist of Dr. Lavinder, Dr. Woodward, Dr. Drake, Dr. Young, and Dr. Frost.

The committee on measures to be taken to prevent the interstate spread of poliomyelitis will consist of Dr. Fulton, Dr. Tuttle, Dr. Williams, Dr. Bracken, and Dr. Banks.

Gentlemen, the next subject will be the epidemiology of poliomyelitis, and I will ask Dr. Frost to let us hear from him.

EPIDEMIOLOGY OF POLIOMYELITIS.

Dr. FROST. Mr. Chairman and gentlemen, I hardly know how to start a discussion of such a broad subject as the epidemiology of a disease so peculiar and complicated as poliomyelitis. Any broad statement must be subject to exceptions, and in any event we arrive at broad generalizations through the summation of our individual experiences. I am afraid that this broad generalization will not give us the picture one gets from the consideration of isolated facts and proved instances, but I will try to run over as rapidly as I can what seem to be the general, outstanding facts in the epidemiology of this puzzling disease. While it is not part of the epidemiology, I do not think we can sensibly discuss the epidemiologic data without at least taking cognizance of what we know experimentally. I shall not go into that in detail, but would like to summarize what we have learned from experiment.

Beginning in 1909 we found that poliomyelitis is transmissible to various kinds of monkeys, and occasionally to rabbits. So far it has not been shown that other animals are susceptible. The only way we have of demonstrating the virus of poliomyelitis is by inoculating monkeys and producing the characteristic effects. Without

going into details the following facts are outstanding. The virus has already been demonstrated as present in the nasal and intestinal secretions of people with poliomyelitis, and in comparatively few examinations of recovered cases some weeks or some months after the disappearance of acute symptoms, we have still found the virus present. Those cases are not numerous, and it leads us to the question of automatic carriers. It has been demonstrated that in some instances the virus is present in the nasal discharges, and with somewhat less certainty, in the intestinal secretions, of persons entirely well, who have been in contact with acute cases. Most of the carriers we have experimentally shown have not been children, but adults.

The other experimental fact of the greatest importance is probably the avenue through which we can infect animals. We can infect monkeys by injecting a portion of the spinal cord into almost any part of the body; most promptly by injecting it into the brain or into a nerve sheath, and not infrequently by introducing it directly into the nasal mucous membrane. Taking the experimental data alone, the introduction through a mucous membrane gives us a definite picture of a contagious disease.

A few instances have been reported of experimental infection of monkeys apparently caused by biting insects, but they have not been thoroughly confirmed. To consider what we actually see in the occurrence of the disease might lead us very readily to a different conclusion as to its contagiousness. We have had several eras, we might say, in our experience with poliomyelitis.

Recognized since about 1840, the disease had occurred since then up to the middle eighties only sporadically, with occasionally some 8 or 10 cases in a small village. Then in the middle eighties, principally in Sweden, we began to notice larger groups of cases, and then we got the clinical picture we now have and a conception of the more severe constitutional symptoms. From that time on to 1905 we had increasingly larger epidemics. The year 1905 marked a new era in the epidemiology of the disease. We then had an epidemic spreading over Sweden, with a total of about a thousand cases. From that time to the present marks another era of practically pandemic prevalence. In 1907 we had an epidemic in New York City, not reported because the disease was not at that time reportable. Following that we had epidemics in 1908 in Massachusetts, in 1909 in Nebraska, and, I believe, in Minnesota and Massachusetts, and in 1910 a widespread prevalence of the infection. Since then we have had numerous cases every year.

Our statistics of the endemic prevalence date back to 1910, but since then we can say that the disease has occurred in every State of the United States, and in every month of the year. This year, I believe, is going to mark another era, because we are now having an epidemic

which, in comparison to what we have previously had, bears about the same relation as the epidemic of 1907 or 1910 to former epidemics.

To repeat briefly what seem to be the salient features: We have the picture of widespread infection, widely scattered, occurring now and then in epidemics of small size, which characteristically are scattered and irregular. For instance, in 1907 there was an epidemic in New York and we did not have an epidemic in Philadelphia. We have at various times had epidemics in New York and Philadelphia, and we have had them in New York and Washington and not in other cities. Characteristically then we have an irregular spread. I think the same thing is shown this year in the reports we have received from various States. We have a characteristic seasonal prevalence, usually in the spring and running into the late summer and fall, about the season when infantile diarrheas are prevalent, and not in the season of ordinary respiratory diseases. I must say, however, that the disease must be largely independent of climatic and seasonal differences. We have records of epidemics beginning in the spring and stopping in the fall and of others beginning late in the summer and running into the winter. We have no such relation with the seasons as we have in yellow fever, which always stops when it becomes too cold for mosquitoes.

Another fact which seems to be uniform is that we have our greatest incidence in proportion to the population in small villages and rural communities. That, I believe, is a universally accepted fact. Take 100,000 people in rural districts or a few small villages, and they are likely to have more intense epidemics than an equal number of people collected together in a large city. Still more striking perhaps is that the total incidence of cases is always exceedingly small in any large group of population compared to the epidemics of our more common infectious diseases. An incidence of 1 case in 1,000 of population or 1 in 2,000 gives us an epidemic of poliomyelitis. This would be only a small endemic incidence for any other disease. In New York we are now getting a much higher incidence, which is a new experience; but even there we are getting only 1 in 750, while in Richmond, which has 100,000 people, we are getting 1 in 450. Now, characteristically, after reaching that small incidence the epidemic has passed out of that area. Already we are noticing that in the groups of 100,000 the epidemic has reached its highest point and is declining. We can not account for that on the ground of any climatic change, because in adjacent territory it is still on the increase, under the same general meteorological conditions. We can hardly account for it on the ground of the removal of the sources of infection, because we have in the territory a large number of cases that must be infectious. It is very difficult to explain it except on the ground of the thinning out of the susceptible population. The con-

clusion is that the disease goes through a population and passes on after having reached only a small incidence.

The next most striking fact is its limitation of age. I think this is of the utmost importance. Characteristically, we have vastly more cases in children than adults. That does not strike us as remarkable at first, but on further thought it is very remarkable. Here we have a disease which spreads all through a city like New York, or even a smaller city, and just picks out the children under 5 or 10—90 per cent of all cases will be in those age groups—and which skips all the intervening older people. With regard to the age distribution it is, I believe, a significant observation that in our large cities generally epidemics have been confined more exclusively to certain age groups than has been the case in rural epidemics. For example, we have had quite a large proportion of adults attacked in epidemics in Minnesota. In all our epidemics in large cities the disease has been confined much more sharply to the age group under 5. In many cities the entire population above 24 years of age, over 50 per cent, remains entirely immune and is not touched by any visible sign of infection, although necessarily they are intimately associated with the others.

I believe we probably have as careful and as accurate intensive studies of poliomyelitis as of any other common disease except typhoid fever. Although these intensive studies have shown considerable individual differences, we can arrive at certain conclusions. Taking up first this, What evidence do we find of contagion? In certain small intense epidemics in small communities we have found just the picture we would expect to find of a highly contagious disease. We find the spreading from case to case, and all the appearance of a contagion. But we consider those as exceptions rather than the rule. Generally speaking, it is true that from 75 to 90 per cent of the cases on the most careful and searching investigation can not be traced to any previous association with the infection, either direct or specifically indirect.

Add those cases in which there has been known specific direct contact with a previous paralyzed or contagious child and those in which there has been indirect contact with a contagious person, and pile on those in which we can not exclude contact, and it will give us about 20 per cent of all cases. The rest of them we can pretty definitely say have not been in contact with any previously recognized case, and usually not with any probable case of poliomyelitis. Considering the children in families affected, we have certain data on the incidence of infection among them. Taking into consideration only paralyzed cases, if we made that our criterion for clinical diagnosis, the statistics in Iowa show that 5½ per cent of children associated with known cases of poliomyelitis in the same

family subsequently developed a frank paralysis. The same statistics in Buffalo show that six-tenths of 1 per cent of the children exposed subsequently developed the disease. If we include in the Iowa statistics the cases of abortive attacks of the disease, as I said before, it doubles the percentage and makes it 11 per cent. If we now include those in whom poliomyelitis was suspected, the percentage is again doubled, making it 22 per cent. Those are high percentages. Ordinarily we get, as a rule, an exceedingly small incidence among those known to be exposed. I think this leads us to the certain, definite conclusion that if the disease is contagious at all a large proportion of the persons who become exposed to it must of necessity, for some reason or other, be immune, or at least resistant to the clinical effects of the infection. If we conceive of poliomyelitis as a direct-contact disease, we have to assume the immunity of a large proportion of the population. I believe we can not get away from this. If it is a purely human contagious disease, it must be spread very largely from sources other than any recognizable clinically sick person, because, looking at it from every angle, we can exclude contact in a large percentage of cases. We find numerous cases occurring on farms 10 or 12 miles from a village, where the child attacked has not been off the farm for a considerable time. The only way it could get the disease at all would be from some adult who had not been himself in known contact with the disease but had simply been in a town or city where the infection existed. That is a remarkable conception, but poliomyelitis is a remarkable disease. If the contagion is confined to human beings, and a large number of persons are immune, it must be spread largely by carriers who presumably are adults.

We have in this disease a seasonal prevalence which is entirely the reverse of that of most respiratory tract infections and is more like that of a digestive tract infection.

I do not think we have excluded the possibility that the infection may be carried from person to person by insects, but I think the more general principle of a spread by carriers would seem to hold.

There is another possibility, purely hypothetical, and that is that poliomyelitis may be a disease of the lower animals, spread from them to man, either directly through contact, through secretions, or by insects. It hardly seems possible that we should reasonably suspect any lower animals except dogs and cats, which move over wide areas. The rapid dissemination within a few weeks from such a focus as we have in New York to the several States is rather hard to hitch up primarily with the spread by insects. If they are responsible, we would not expect the disease to spread so fast. Its rapid dissemination is apparently accounted for only by the rapid travel of

human beings. Also, thus far we have been absolutely unable to prove that domestic animals are even susceptible to the infection.

If poliomyelitis is a disease of animals, it must be largely a nonparalytic disease, because for many years epidemics have been absolutely and entirely without evidence of paralyzed animals; so that this connection with animals is at present hypothetical. Probably we must say frankly that we do not know how the disease is transmitted, but that the evidence points to the human being as the sole agent and to contact with nonparalyzed cases and carriers as the most important source of infection.

Dr. Dixon. Some of the French experiments show that there may be some connection with the spread of the disease by rats and mice.

Dr. Frost. Quite serious study has been given to rats and mice. It hardly seems to fit in with the epidemiology of the disease.

Dr. Dixon. No; but I wondered whether you had made any study of it.

Dr. Frost. No, sir.

Dr. Dixon. The French say that they have, and they have found some connection.

Dr. Frost. I was under the impression that they said that they had not.

Dr. Dixon. That was the last information I had. We are just trying that out.

Dr. Woodward. I should like to ask Dr. Frost a question concerning the epidemiology as to animals in the animal house connected with a laboratory. It seems that, if this disease is as rapidly spread as it is alleged by some, an inoculated monkey in an animal house, which had developed the disease, ought to be a source of acute danger to other monkeys, and also to the attendants. The results, of course, will show with respect to the other monkeys, because they are demonstrated later, some of them at least, to be nonimmune. They are used for experimental purposes. I would like to know whether there are any definite and specific precautions taken in the ordinary animal house to prevent the spread of the disease by natural processes from the infected monkey to noninfected monkeys and from the monkey to the rabbit, which also seems to be a possible reservoir of the disease, or to the attendants, and whether there is any evidence of the carriage by the attendants to their families of the contagion to other persons? Do they become carriers?

Dr. Frost. No, sir; there is no evidence of spread in this manner, and monkeys have been associated by scores with infected animals without taking the disease. Of course, in all laboratories where there appears to be danger of persons carrying the infection to their homes, rabbits and guinea pigs have been isolated. In one or two

instances guinea pigs isolated with monkeys have developed suspicious paralysis that was not definitely ascertained to be poliomyelitis.

Dr. STILES. Mr. Chairman, without having seen an active case of poliomyelitis, I am, of course, an expert on the subject. I should like to throw out a thought for consideration. It does not seem to have been touched upon as yet. Have we not in poliomyelitis a disease which is in the making? There are certain strong arguments in favor of this view. Have we possibly in poliomyelitis a disease which is due to some bacterial or other parasite of an insect which is absolutely nonpathogenic for that insect, but which when transmitted to the human being becomes pathogenic? We have cases of this kind. There are some among us who believe rather strongly that there are parasites of insects which are absolutely or relatively nonpathogenic to the insect, but which may be transmitted to man under certain conditions and become pathogenic. For instance, malaria, in all probability, is an acquired disease in man. The biology of the parasite seems to indicate rather strongly that the malaria organism was originally of the coccidial group and nonpathogenic to insects, and that upon being transmitted to man it became pathogenic.

Kala-azar is another disease of the same general category, a disease due to protozoan parasite that is apparently nonpathogenic to insects. Transmitted to man, it changes its habits and becomes a pathogenic parasite.

Everybody is guessing at the present time, and I thought possibly I might be entitled to a guess. I simply throw this out as a suggestion which has not been made by anyone else thus far, and which may possibly give a new lead in the line of thought.

Dr. WOLFF. The real object for which I contend this conference was called is to ascertain, if possible, whether the gentlemen who have made intimate studies of poliomyelitis have determined what the stage of incubation of the disease is. That becomes an extremely practical point for the health boards who manage the disease, because it determines just how far you should extend your quarantine or how far you should extend the separation of those who have been exposed to or in contact with the disease. For example, as a point in this regard, in the city of Hartford, Conn., on July 10, a case was reported which died on the 13th day of the month, and on July 21 a second case occurred in this family. Now, this second case had had no contact with any other case except this particular one that had died 10 days before, which rather gives the stage of incubation in that case as about 11 days.

On August 4 a person who had been playing with this second case and had had no contact with any other case of poliomyelitis

was attacked and on August 12 two cases, one of which was fatal, occurred in a house right next door; this gives us an incubation stage, also, of about eight days. From these three cases 78 other cases can be traced, and the average period of incubation was between 8 and 11 days.

My object in speaking of this is to open that part of the epidemiological discussion which would be of eminent service to health officers.

The CHAIRMAN. Does any gentleman desire to make further remarks on this subject?

Dr. TUTTLE. I forgot to make a motion, or rather a request, that the remarks of Dr. Draper and of Dr. Frost on symptomatology and epidemiology be published as soon as possible in pamphlet form and furnished to the various State health officers, in order that they may be of service to physicians. Last year the Public Health Service published a little pamphlet on the diagnosis of spotted fever, and I have had many calls for that pamphlet. This year Dr. Lloyd gave us a small pamphlet on the diagnosis of smallpox. I know that the health officials of Washington will thank you as I thank Dr. Frost and Dr. Draper for what they have given us. I hope we may have reprints made at an early date.

The CHAIRMAN. We will be very glad to bear that in mind. Is there anything further?

Dr. J. P. LEAKE. There is a point that might not be within the knowledge of all, and that is the extreme variability of the incubation period. We know only very little as to the definiteness of the beginning of incubation. In many cases there is, of course, experimental evidence, and in animals the disease is almost akin to rabies in the great variability of the incubation period. We have, in two cases reported in California last year, as long as 52 and 56 days, respectively.

The CHAIRMAN. Gentlemen, this question is open for free discussion.

Dr. PORTER. Mr. Chairman, the State and municipal health officers of this country are intimately connected with the public, and the public will want to know what this conference has concluded and what it has decided upon regarding this disease. It seems to me that it is important that some brief, yet concise statement, should be made, so that it can be given to the public. Therefore I make a motion that the chair appoint a committee consisting of these gentlemen who have given us such interesting epidemiological talks on this subject, to put in a concise and brief statement what is known at present as to the cause of this disease, its mode of spread, and the general symptomatology.

Dr. CARR. I second the motion.

The SECRETARY. I will say for the benefit of the conference that, while I do not oppose this motion at all, the service has already gotten out certain publications on this subject. One is the recent bulletin of Dr. Frost on poliomyelitis, what is known of its methods and modes of transmission. Another is a little story that was written in what we call a health news, which has been distributed very widely over this country. It seems to me it just might be possible that there is no need of duplicating what has already been done; but at any rate, those things would form a basis of the committee's work.

Dr. PORTER. My idea, Mr. Chairman, was that this committee should not only consider all the publications of the Public Health Service, which has done such excellent work, but also should have the advantage of the experience of members of the conference in civilian life who have had peculiar advantages in this respect in the recent epidemic in New York City.

Dr. FRANTZ. The first thing I shall be asked by two or three or four or half a dozen railroad, steamboat, and trolley men, when I reach home, will be, "What have you done at Washington?" They will be the first people who will ask me. Why? Because they are financially interested. Our transportation companies are losing money every day. If we are committing a wrong in quarantining, and requiring more than is necessary, we should change our requirements. But be that as it may, we will have to go home with some report as to what we should do with our railway and steamboat traffic, etc., and whether we will make any change in the rules and regulations which we have already established. Now, if we can secure some report of that character I think it will be better than any scientific document, because we can not take that home. The railway men here are waiting for something more positive in that line.

Dr. COLLINS. I agree with Dr. Porter, of Florida, and I consider that a brief, concise statement as to what we have done here on this occasion will be a relief to the people in our State. The railroad companies are constantly appealing to me, and it is a practical proposition. As to the scientific side of it, I believe from what I have heard here that we are still in doubt, and that we do not know just where we stand. However, we can agree, and we ought to agree, so as to be able to go home and deal with our utility organizations, railways, steamboats, and trolley lines. I am replying to inquiries all of the time. I have friends in New York, and they want to know whether they can come home or not, and all that sort of thing. I want a statement such as the doctor suggested, drawn by a committee appointed by the conference and adopted or rejected as we may see fit. As Dr. Frantz says, he has got to answer to his people, and I know I have to mine; a report written, and adopted by this

conference, which can be placed before the great masses of the people with whom we have to deal, is what we should have, and I feel like insisting on the doctor's motion.

Dr. SWARTS. This statement will rest very materially on the reports of the various committees.

Dr. COLLINS. I think this committee ought to report along with the committees which have been appointed. If I understand the proposition, they are really inseparable, and a broad document consisting of the three reports might be the very thing we desire. I think we ought to have something to carry home to our people. I believe a correlation of the three reports would be very appropriate.

Dr. OPPENHEIMER. I think the consensus of opinion seems to be that an indiscriminate quarantine will not be carried into effect. I consider that is the great danger we all run, that a general quarantine will be put into effect, and not only result in an individual paralysis but a general paralysis of traffic.

Dr. KING. I think that the intention of the motion was to formulate some statement that might be given to the press. They are now, I know, clamoring for statements to send out, and I understand that the idea in the motion suggested is to produce something that may be sent out to allay the fears of the laity in general. If that is the idea of the motion of Dr. Porter, I think it should be carried out, irrespective of the other, and that this conference should adopt these means set forth by the Public Health Service. I understand that is the object of the motion.

Dr. YOUNG. The thing I am the most anxious to carry home is the report of this committee on the prevention of the interstate spread of the disease. Four or five years ago we planned a circular on poliomyelitis. Lately I have been rewriting and preparing an eight-page pamphlet, and before I came here to this conference I had the idea of putting it in the hands of the printer and rushing it off; but I concluded to wait until I returned. A good many questions have come up as to the form of the certificate to be used. This matter of the settling of the form of the certificate I should like to have decided as soon as possible, and so I should like to inquire when we can probably have the report of that committee—when will they complete their work?

Dr. DRAKE. Mr. Chairman, as I understand it, the most important part of the entire conference is just before us, on the method of the control of the disease, and until that has been intelligently discussed and a committee appointed possibly to formulate minimum requirements, I do not think that there is much we can say at this particular time.

Dr. WOODWARD. If I understand the purpose of Dr. Porter's motion, it is that we prepare a brief circular on how to avoid infantile

paralysis. Now, if we can agree on a brief circular of that sort, by all means let us do it; but until we can, I am afraid we are going to fail to satisfy the public and we are going to display, not what we know about infantile paralysis but rather the great blank page of what we do not know. This body can hardly at present agree on any statement of accepted scientific facts concerning infantile paralysis that will be of great use to the public.

What the public wants, as I understand it, and what this body wants, and what the railroad men want, is some rule of conduct based on the best knowledge we have. It will certainly be the function of this committee on interstate and intrastate prevention to present such rules, as far as they can be laid down. It seems to me if we have one committee at work along the lines of practical administration and another committee undertaking to sift from the vast mass of undigested data material which they can approve, we will have trouble possibly in reconciling the practical application of the facts recommended by one committee with the facts that another committee asks us to indorse. I am heartily of the opinion that the whole matter of advice to the public had better be left to the committee on interstate and intrastate quarantine. When we have adopted their report we can then appoint a committee to prepare some scientific leaflet.

Dr. Parlett. It would seem, speaking from a railroad standpoint, that something should be adopted, because the railroads are affected by virtue of their function as common carriers. In some States no certificates are required; in other States certificates are required to be carried by both adults and children; in still other States, where the conductor finds that children have not certificates, they are put off the train. I have a telegram this morning stating that four children were put off a train at Washington, Pa.—put off in the woods. Naturally the public will object, and the railroad companies object; and if there is anything we can do at this meeting, so that the railroad men representing the various railroads here may take back to their managements something that will help them as well as the public, I think it ought to be done. The railroads are perfectly willing to help. I think we have given ample demonstration of that, and we want to continue to render assistance. But we do not know whether to put up this notice here or that notice there, or not to issue tickets to children who do not have certificates, or if they present certificates whether or not they should be recognized as bona fide certificates. If we can have the seal of the State stamped on the various certificates when they are presented, so that they can be identified and stamped by the ticket agent and later taken up by the conductor, we will know what to do.

Dr. Garrison. I move, as a substitute for Dr. Porter's motion, that his motion be laid on the table until we have a report from the interstate committee.

(The motion was seconded.)

The Chairman. You have heard the motion, that the motion of Dr. Porter be laid temporarily on the table.

Dr. Porter. I am perfectly willing, Mr. Chairman, to withdraw it. I simply wanted to be able when I leave here to go down to Florida and when they ask me, "What did they do up at the conference," I will not have to say, "I do not know what they did. They did not seem to come to any conclusion as to what causes this disease or how it is spread or anything about it." I want to be able to say something, and to say it intelligently; and I am perfectly willing to withdraw my motion in favor of anybody else's.

The Chairman. I hope Dr. Porter will renew his motion later.

Dr. McLaughlin. Mr. Chairman, we are not getting anywhere, and we are wasting a lot of valuable time. We can not do anything until we get the report of that committee. We can not prepare a statement for the railroads or anybody else until we obtain the report of that committee and put the stamp of this conference upon it, and then we can give out a statement.

Dr. Woodward. I think there is one thing we can do before we get the report of the committee which will help very much, and that is to discuss this next topic, "General principles of control." If the committee can go into session with some knowledge of our suggestions it will be an advantage to them. I move we have that discussion.

(The motion was seconded.)

The Chairman. Without objection, we will so proceed. I would like very much to have Dr. Haven Emerson open this discussion.

GENERAL PRINCIPLES OF CONTROL.

Dr. Emerson. I think I have really nothing to say on this. The only methods of control that the New York City department of health has attempted to put into force were the immediate reporting, prompt diagnosis, and removal of cases to the hospital. We discussed the matter with the best available talent in the vicinity of New York, and all of the officials agreed that until we had tried isolation of those affected, and had obtained reports of all possible cases and verified the diagnoses by competent diagnosticians, no other measures could be attempted or would be likely to prove effective. We judged that if our experience with other diseases was worth anything, 90 per cent of the trouble was going to come from the persons who were or had been sick. It may be that this disease is going to

be contrary to all other infections. It was our idea to get all the patients under fly screens, so that they would not prove centers of infection.

We adopted various measures also which seemed appropriate to our locality, limiting the movement of the children. We attempted to interfere with the congregating of children at moving-picture theaters, large picnics and excursions, and so on, and we have headed off a good many such mass groups of children. That prohibition still continues. Whether it has accomplished anything there is no possible way of telling. We realized that this procedure was not entirely beneficial, and we have had the mortification of going through our streets and finding the windows of tenements shut in the summer season lest this terrible "miasm" come into the houses and seize the children. We have had this warning produce the housing of children in wholly unsuitable places for fear of physical contact, and in spite of all this we have had the lowest infant mortality this summer in the history of the city. [Laughter.] The only thing we tried to do was to hospitalize the cases as soon as discovered, or to put them under conditions as near the equivalent of hospitalization as possible, and to avoid all unnecessary crowding and grouping of children.

You will see we have not endeavored to keep them off trolley cars or off the streets, but instead of setting aside play streets for the special gathering of children, away from traffic, we have tried to encourage their playing in their own premises, and not to mix unnecessarily with children from other places. We have kept as many of the camps open about the city as could be subject to ordinary observation. In other words, we encouraged the gathering of children whom we knew came from noninfected premises, provided medical supervision could be enforced. I do not think our control has been based on any other lines. We took advantage of this epidemic to obtain a more general and effectual enforcement of the reasonable requirements of the city with regard to the removal and covering of garbage cans, and the cleaning up of dirty places, but we did not do that with the idea that it would have anything to do with stopping the spread of the epidemic. We did it with the idea of taking advantage at this time of public susceptibility and we considered that the time was favorable to hit hard and try to get the people to obey the law.

The SECRETARY. Gentlemen, if I may I desire to speak on this subject just for a moment, for the purpose of summing up and attempting to crystallize the methods of control brought out to-day. It would seem to me that we can put this thing in a relatively few words. The notification of all cases; the prompt diagnosis of all infections, particularly those of children; the isolation of contacts

and actual cases, including enforced hospitalization where possible; the control of acute and chronic carriers wherever they are known to exist; the prevention of susceptible persons coming in contact with large numbers of other persons, including gatherings at theaters, churches, and schools, are all essential.

We must admit that if the schools are permitted to open under an accurate, active medical inspection, a great many children will be better off than if they are forced to stay at home. On the other hand, there may be, and doubtless are, children whose home conditions are so good that they can remain there without running the danger of coming into contact with children who are acute or chronic carriers of the disease. With regard to the playgrounds, it would appear to me that there is a good opportunity for the medical inspection of a large number of children.

Concerning the control of travel, it seems to me that the consensus of opinion expressed by the speakers is that travel is dangerous in so far as it permits the movement of acute or chronic carriers of the disease.

With regard to insects the evidence to-day is apparently against insect transmission.

It is extremely doubtful if food supplies play any great rôle in the spread of the disease.

Concerning the relation of sanitation to the disease, of course, we, as preachers of the gospel of sanitation, are always willing to take the opportunity to make conversions, but it seems to me as though the sanitary measures as applied to this particular disease are the use of a scatter gun or blunderbuss rather than the use of a rifle. [Applause.]

(Asst. Surg. Gen. Rucker here took the chair.)

Dr. Bracken. I am supposed to be in committee, but I want to say a word before I go. One thing I deem most important in the control of this disease is that physicians throughout the country recognize it. They do not always do this, and the disease is called all sorts of things. That is one matter which we must see to. First you have got to catch your hare and then skin it. If we recognize, or bring the doctors up to the point of recognizing, this disease, then these points which have been made by Dr. Emerson and Dr. Rucker come right in line, the matter of reporting and isolation. I am very glad indeed to have this point of hospitalization brought out. Fortunately we are not all of us situated as Dr. Emerson is in New York. Most of the children in Minnesota probably have 16 square miles to play in per child, yet isolation even for them is important. We have been handling our communicable diseases at home in quarantine all along, when they ought to be hospitalized. We ought to take the individual out of the home and leave the home free.

Dr. Albert. I should like to ask Dr. Emerson in regard to the isolation of cases, and also what is done to control the contact of the child with the family?

Dr. Emerson. Every patient we have discovered and accepted as a true case has been isolated for eight weeks. We are beginning to discharge cases now. The quarantine period of eight weeks begins from the date of onset and not from the date the diagnosis is established. All children under 16 years of age in the families of or in contact with acute cases have been kept within their premises for two weeks. If the case is removed to the hospital, the other children of the household are kept at home two weeks; and if the case dies, they are kept at home two weeks. If, therefore, the patient is kept in the home for his eight weeks' quarantine, instead of being sent to the hospital, the other children of the family must stay two weeks more beyond the quarantine period of the acute case. That means 10 weeks. If parents choose to run the risk of keeping the child at home, they must abide by these principles, which we have carried out from the beginning. The incubation period is quite uncertain, and it is a guess as to the necessary period for quarantining. We have done what we thought was practical and not what we considered scientific.

Dr. Hayne. I simply want to ask a question with regard to the spraying of the nose and throat, whether it has any prophylactic value. In cerebrospinal meningitis I do not close the school, provided the children before entering have their noses and throats sprayed with an antiseptic solution; we usually use Dobell's solution. I was under the impression that that was a good method until reading in some of the newspapers—and we have had a great many articles, inspired and otherwise, in regard to the control of this disease—in which it was stated that spraying not only was not beneficial, but that it actually did harm, because it injured the delicate mucous membrane of the nose and throat and probably thereby increased susceptibility. Now, of course, I know doctors are immune to all diseases and carry none of any description. Consequently when I visit houses where there is infantile paralysis, and I have had to visit 25 or 30 within the last week, I in my ignorance used to spray my nose and throat, with the idea that possibly I might not carry the infection to my children or to other persons. I should like to obtain the consensus of opinion whether that does any good or whether it is just a useless method of annoying one's self?

Dr. Emerson. I can not give you the consensus of opinion on this matter, but I can tell you the consensus of opinion of the city specialists and others to whom the question was referred for an opinion at the beginning of this epidemic. Physicians generally used an atomizer with a normal salt solution. Practitioners in the city in

general are against the popularizing of the use of the nasal spray among children.

As a matter of fact, as to carrying infection, the president of the medical board of one of our hospitals lost one child and another child was infected, and it seemed as if he might have carried the disease home to his family. I think that will bear a little statement in explanation. The practice of the doctor was to change his clothes and get into a suit of duck when he reached the hospital and to wear his gown and cap. He washed his hands and face before he left, and when he returned home he changed into other clothes. He never took his children in his arms or kissed them or had them about him, and he had a separate entrance to his office, an office apartment. A further important fact is that the nurse of those children, a Polish woman, left after she had put the children to bed and went and spent the night at the home of her sister, whose child was infected, returning the next morning to the doctor's children. She, with her habits, coming from an infected case, appeared to us and to the doctor who lost the child as the more probable carrier.

I think every doctor always takes the precaution not to get into the spray line of a patient, and that the habits of doctors become so self-protective that they are least likely to carry infection. Physicians do not go into houses where there are healthy children looking for a case; they go when they are summoned to a sick patient. We have not found that the infection could be traced in any way to the doctors and nurses in attendance at hospitals. You must remember that these patients have been admitted to general hospital wards, and no single case has ever developed under hospital conditions. Now, why is it?

Dr. McKelvey. I presume Dr. Emerson is tired of answering questions, but I should like to ask him to what extent fumigation is used in New York and to what extent it has been used in this disease?

Dr. Emerson. It was abandoned throughout the city two years ago for all diseases. We do not use it. [Applause.]

Dr. Swarts. Do you mean disinfection or fumigation?

Dr. Emerson. I mean disinfection by fumigation.

Dr. Swarts. In connection with this disinfection by the use of a spray and the application of Dobell's and other solutions, I think it is a good idea not to recommend it to the public for general use, because they are likely to apply too strong a solution and injure the cells of the mucous membrane, which are a protection, in a measure, against organisms of every kind. Furthermore, I should like to know whether the opinion is correct that the removal of tonsils and adenoids causes a predilection to this disease?

Dr. EMERSON. The consensus of opinion is that no operations for removal of tonsils or adenoids should be done when the disease is prevalent, lest it make the patients more susceptible to infection of every kind.

Dr. YOUNG. The question now arises as to individual hygiene. I believe great good could be accomplished if a committee were appointed to formulate rules and regulations, or an outline of the hygiene of the individual in his relation to poliomyelitis; not only for the individual physician, but for the individual himself.

Dr. MCKELVEY. When I asked the question awhile ago as to disinfection I was fully aware that New York had abandoned what is ordinarily known as terminal disinfection, but recently I have seen something in the press regarding fumigation or disinfection which led me to believe that possibly some exception was made in the case of this disease. But we have in the rural sections of the country certain conditions that are not existing in New York City in regard to disinfection. In New York City they have the means and the men to go to the houses and carry out certain rules and regulations as a substitute for disinfection employed throughout the country more generally. In the rural districts you can not do that. It seems to me that it would be proper for us to have an understanding as to how disinfection should be employed. That is what I wanted to bring before the conference. What are we supposed to do in the rural districts? We can not in all instances have a health officer to superintend the repapering and repainting of the walls of the building and of the floors. There should be some general plan worked out.

The CHAIRMAN. It seems to me, Dr. McKelvey, you could trust to the layman in painting and papering and calcimining better than you could to the action of a gaseous fumigating agent; the fact is that soap and water and a good strong elbow kill more germs than formaldehyde ever thought of killing.

Dr. WOODWARD. I should like to ask those familiar with the epidemiology of the disease whether there are any instances of school outbreaks. It might throw some light on the subject whether history records institutional outbreaks. Dr. Emerson has referred to New York, where great care is taken to prevent their occurrence. My recollection is that in New England there was an instance where without the exercise of any precautions the institutional population largely escaped. My question was whether there have been school outbreaks of any kind, and I think it is very pertinent to the present situation at the present time of year.

Dr. FROST. Answering Dr. Woodward's question, there are records of outbreaks apparently connected with schools. I have in mind some Swedish outbreaks that Wickman reports. He considered that the schools were sometimes the foci of infection. I can personally

report one outbreak which seemed to very definitely originate and be spread from a small country school. I have seen at least one outbreak in a large city, where the schools were open, and where there was no evidence of their acting as disseminators of the disease. I think in one school in the kindergarten grade we had two cases. In other schools we had only isolated cases among the pupils.

In regard to institutional outbreaks I do not recall anything definite regarding their occurrence. I think it has been generally the fact that institutions have been rather free. That is my impression. I have occasionally seen one or two cases in large institutions, but not constituting an outbreak of any proportions.

Dr. STILES. At the present moment it is not a question of closing but of opening the schools. Take our Washington schools; the pupils are scattered from Maine to Florida, and as far west as California. They will open here late in September, I have forgotten the exact date, but about the 25th of September.

The CHAIRMAN. It is the 18th.

Dr. STILES. Is it wise, under present conditions, to have the Washington children return to the schools and mingle with other children, who have been away all over the country, or is it wise to bring those children back to Washington and to open the schools as early as the 25th of September? I should like to emphasize the point that it is not a question of closing the schools at the present moment but of having children all over the country travel from infected districts back to their homes, in many places to uninfected cities, to enter the schools. It looks to me as if that were one of the critical points to be discussed of the present situation.

Dr. FRANTZ. Mr. Chairman, I should like to say, relative to the schools of Delaware, that any child coming from an infected district, or who has been in contact with infantile paralysis infection, will be taken care of in the State of Delaware, and will not be allowed to go to school for two weeks after he returns. Unless we should have an epidemic, or more cases than we have had in Delaware, we will open our schools the second Monday of September. That is a question which each State must solve and settle for itself. But I think that with the report which we hope to get, through the deliberations of this organization, we can take care of all these children.

Dr. YOUNG. As to the bearing of opening the schools upon the economic question. Just before I started to come on here I was called to make a rapid run of 16 miles to a large summer hotel on account of two or three cases of typhoid fever among the help. The manager of the hotel told me that many of his guests would remain there much longer than usual. They had declared that they would not return to New York City or other places where there might be poliomyelitis, until November. I have heard similar re-

ports from the managers of other hotels along the coast and in the interior of Maine. That is just a point on the economic question.

Dr. CARR. Mr. Chairman, in Nebraska we will open our schools about the 11th of September. We believe that where there is good school inspection and the children are healthy, we are better able to keep in touch and to cope with disease of any type. Hence our schools will commence in Nebraska on time.

Dr. MCLAUGHLIN. I would like to ask Dr. Emerson a question, but I have not the heart to do so. I think it is really unpardonable the way we have imposed upon Dr. Emerson, and I want to say, in my opinion, how fortunate the city of New York, the country at large, and this conference in particular, are that the health commissioner of New York is a gentleman and a scientist. [Applause.]

Dr. Haven Emerson as a scientist does not lose sight of the opportunities of finding out just how this disease is transmitted, but has thrown open the scientific resources of his department, and has welcomed the scientific aid which may come from outside sources, and given to those outside his department every opportunity to come there and use what he has. As a gentleman, he has attempted no concealment whatsoever, and along the Atlantic seaboard I know we appreciate the frankness with which he has declared what he had and has shared with us all the information in regard to this baffling epidemic. [Applause.]

The CHAIRMAN. I am very sure that Dr. McLaughlin voices the sentiment not only of the Service in this conference, but of the Nation as a whole, and I wish not only to second very frankly everything Dr. Emerson has said, but to express our gratitude to him for coming to-day and giving of his very precious time to help us in this present emergency. [Applause.]

Dr. TRASK. I should like to add just one word to what has been said. In times of epidemic the natural tendency on the part of the community is not to see or recognize the presence of an outbreak. The natural tendency is to want to suppress facts, or not to let them become known. Many communities have, especially during the last decade, shown a tendency to overcome this natural inclination, and have firmly and positively warned other States, cities, and the Nation as a whole, and I believe sincerely it has resulted in their own benefit. But there has been no instance I know of where the tendency to absolute frankness has been so marked as in the present outbreak in New York City, and if it is the consensus of opinion of this conference I think it would be a most excellent plan to indorse in decided terms the stand in regard to publicity and frankness which has been displayed by the Department of Health of New York City. [Applause.]

Dr. PORTER. I second that motion.

The Chairman. It has been moved and seconded that this conference indorse the policy of publicity carried out by the department of health of Greater New York.

Dr. Woodward. I should like to move to amend that by saying that the Public Health Service shall send a copy of that, as prepared, to the mayor of New York and to the press of New York.

(The motion of Dr. Woodward was seconded, and the question being taken, the motion as amended was agreed to.)

The Chairman. Gentlemen, the hour is getting late, and we must decide what we will do with the remainder of the program. Is it the wish of the conference that we shall convene this evening for further deliberation or adjourn until to-morrow?

Dr. Woodward. Before we adjourn, I want to say I think it is important that we know when these committees will be likely to report.

The Chairman. It seems to me if the committees could do their work this evening it would be wise for the conference to adjourn until to-morrow morning. That would give the evening to the committees to work.

(At 5 o'clock p. m. the conference adjourned until Friday, August 18, 1916, at 9 o'clock a. m.)

MORNING SESSION, SECOND DAY.

(The conference was called to order at 9.30 o'clock a. m. by Asst. Surg. Gen. W. C. Rucker, acting chairman.)

The Chairman. The conference will please be in order. The first subject for consideration this morning is "The relation of the community to the aftercare of poliomyelitis patients." I think that in the discussion of this subject the conference would do well to consider not only the important points of the medical and surgical treatment but particularly the sanitary aftertreatment, and I will ask Dr. Albert, of Iowa, to open the discussion.

THE RELATION OF THE COMMUNITY TO THE AFTERCARE OF POLIOMYELITIS PATIENTS.

Dr. Albert. The seriousness of poliomyelitis is regarded as so great that many people feel they would prefer to have their children succumb to an attack of the disease rather than to be affected by the paralysis which often cripples them for life and makes them dependent, or very largely so, for the remainder of their days. The situation is, however, by no means so hopeless as it has seemed to be in the past, and a great deal can be done, as is now well demonstrated, in the way of preventing the deformities in the first place

and in curing them after they have developed. I presume the reason why the chairman asked me to open this discussion is because we have a place in Iowa where we undertake to overcome these difficulties to a large extent. Overcoming deformities in necessarily a long procedure and an expensive one. Heretofore only the well to do have been able to give their children the proper kind of care. The poor have usually neglected their children, and they have often become charges on the community.

The last legislature in Iowa made provision by statute for the sending of children to the University Hospital for treatment, including provision for free treatment and for payment of all expenses. Most of the children who have come under this law were either crippled or deformed, and a large portion of them are children who were deformed during the epidemic of poliomyelitis which occurred in our State in 1910. At that time we had several hundred cases. During the past year some 80 children have received treatment, and it is remarkable what results have been obtained. I am sure that when our administrative authorities go to the legislature the coming session for an increased appropriation for this service, there will be no difficulty in obtaining it. The results have been very remarkable and satisfactory, and universally praised. Nevertheless, the results obtained have been in the nature of correcting deformities, while the object should be to prevent these deformities as far as possible. It is quite certain that as an outcome of the present epidemic we will have a large number of early cases sent to the University Hospital, with the idea of preventing deformities. I may say that it has been our experience, and I presume it has elsewhere, that physicians in general do not pay sufficient attention to the questions of massage and other procedures in the way of properly reestablishing circulation, with the idea of having the muscles regain their functions.

I think that the attention of physicians ought to be called to the fact that a great deal can be done to prevent the serious deformities which often follow attacks of poliomyelitis.

This is a thing which it seems to me has been very largely solved in our State, and it has been done, of course, by many municipalities also. From the standpoint of the State, the best solution of the problem is to make provision for these children, to have them treated in a State institution at State expense, and not only to treat cases such as we have been treating during the past year, but also the rather early cases, after the patients have recovered from the acute disease.

Dr. Rankin. What has it cost in Iowa, per capita, or case, to do this?

Dr. Albert. I am not able to tell you. No figures have been available as yet. We have been operating only nine months.

Dr. WOLFF. How much of an appropriation have you?

Dr. ALBERT. It is rather a peculiarly worded law. The law says that the patient shall be sent to the University Hospital and that the county shall pay the transportation charges. An examination by a physician is provided, for which the physician receives $5. All other expenses are borne by the State. The medical expense is borne by the university. In this way the law serves a double purpose. It renders to the poor people of the State a service and also furnishes the university medical department with clinical material.

Dr. WOLFF. And what is the total appropriation?

Dr. ALBERT. I was getting back to that. For the medical and nursing service no charge is made. It is presumed that the hospital physicians will render their service without charge. Now, the question of the so-called hospital charge is referred back to the executive council. No appropriation is made, but whatever it costs to maintain the patient in the hospital, aside from the medical and nursing service—simply the hospital room, board, etc.—is charged to the executive council of the State, and so far no figures have been available. No appropriation of any kind is made.

The CHAIRMAN. Will some one else discuss this subject?

Dr. PORTER. I should like to say that in Florida several years ago the legislature passed a bill providing that the indigent crippled children of the State should be cared for at the expense of the State board of health. Until the number was found sufficient to warrant the construction of a hospital and provide a staff therefor, the State health officer was authorized to arrange for their care in any private or public institution. Since that time we have added to the staff of the executive force of the State board of health a surgeon of prominence and of expert knowledge in orthopedic treatment, and we have treated numbers of white children at St. Luke's Hospital and colored children at the Brewster Hospital. This treatment has been free of any charge where the patients were indigent, the only requirement being that they shall present themselves at these hospitals in Jacksonville. We hope at no distant future to be able to construct a building especially devised for this purpose. The bill under which the work is performed had its inception with Gov. Gilchrist, of Florida, who had a philanthropic desire to aid the crippled children of the State. There is quite a little history attached to it, which it is not necessary for me to go into right now; but there has been a vast amount of good work done. Those of the conference who receive the annual report of the State board of health of Florida will notice in the appendix a great many interesting photographs of cases at their inception and after subsequent treatment.

Dr. WOLFF. What is the cost per patient?

Dr. Porter. Independent, I think, of the salary of the surgeon, we spend some $6,000 annually. That is for the hospital care of patients and the first braces. Subsequent braces are paid for by the parents, but their fitting to correct deformity is defrayed by the State. I do not know the exact amount, but those of you who have our report—and every health officer in the United States has one sent to him each year—can refer to the table, ascertain the details, and observe the photographs.

Dr. Carr. Mr. Chairman, Nebraska is very proud of the work she has done for crippled and deformed children, and as I reported here yesterday, is making great strides in this line of endeavor. A few years ago we obtained an appropriation, after a hard fight before our legislature, of $10,000. The next legislature gave us $100,000, and so it has been ever since; we have been able to get any amount that is needed and required for this special line of work. It is a line of work that is especially appealing, and legislators, when they go out to our orthopedic hospital, simply come back and say, "Why, you can have any amount, at once." It is surprising that we are not able to get over about $20,000 annually for health work in Nebraska, but for deformed children we can obtain any amount we ask for.

This work is not under the State board of health, by the way, but it is under the board of control of the State, and all patients, both indigent and rich, are served alike.

Dr. Swarts. Mr. Chairman, it little behooves the health department, perhaps, to indicate to the physician what shall be the treatment, but in the absence of knowledge this practice is quite prevalent among officials. It seems proper that indigent children should be taken care of by those who have information which is of value, and for this reason the departments of health should state or suggest to the physicians who are not willing to obtain knowledge from other sources what has been found of advantage in these cases. Physicians are looking to us for this information, which we should endeavor to collect. We should know that there is a possibility of deriving some benefit, not alone to the individual patient but from an economic standpoint to the State, in the conservation of the power of such muscles and nerve filaments as may have been left only partly affected, or intact and unused from lack of encouragement. Efforts along this line are commendable, and it is a pleasure to see that the Western States, which are so far ahead of the effete East, are alive to this fact. I trust that this conference, before it decides to close, will take some action on this matter, recommending that health departments secure from their legislatures as much assistance as they can get to place these cripples in a condition whereby they can care for themselves, because it is of distinct benefit to the State. I heartily indorse

the work which has been described in these Western States, and hope we may have some result from these efforts.

Dr. LADD. Dr. Emerson, of New York City, wanted me to make the following statement: They have decided in New York to follow the same general course we have adopted in Vermont, and they have already organized a permanent committee. As a patient is discharged from the hospital he is given a written statement of just the condition he is in at the time. They also give a list of orthopedic dispensaries of the city, so that the patient can be taken to the nearest one. It is the duty of the organized and permanent committee to follow up the work and see that the patient is taken to one of these institutions. Muscle training is also taken up at the home through the urging of this committee. The State is to be districted, so that the work may be systematized.

The CHAIRMAN. It seems to the chair that while the prevention of this disease is the function of the departments of health, we should not lose sight of the fact that if we fail to prevent it we will have these cripples. One of the most pitiful things with regard to poliomyelitis is the fact that thorough aftertreatment results in such slow progress, and from month to month very little improvement can be noted. The result is that the parents become discouraged. They cease to patronize a reputable physician, and they begin going around to quacks who advertise, "We cure paralysis." They go from quack to quack until a condition is arrived at where the family resources have been exhausted and the opportunities for cure of the patient have been entirely lost. I think that the movement which has been started in New York for the creation of a fund to provide treatment at a special hospital for these children is one of the greatest and most beneficent philanthropies that could come at the present time. Much as we, as health officers, want to prevent the disease, I still think we should not overlook the raft of human wreckage which follows in its train. [Applause.]

If there is no further discussion on this question, we will now receive the report of the committee on uniform methods of collecting statistics regarding poliomyelitis. Dr. Lavinder.

REPORT OF COMMITTEE ON UNIFORM METHODS OF COLLECTING STATISTICS.

Dr. LAVINDER. Gentlemen of the conference, the committee, in making its report, has two or three things to offer. The first is that there are representatives of a large number of States here, and they all came prepared to give us a certain amount of data. I do not know how great it is, but it is valuable to us, so that we have prepared a form for temporary use, to be distributed among the gentle-

men present, with the request that they offer their suggestions before they leave, and that they fill out this form giving us the information they have with them. Many of them have already made reports. Copies of this form will be distributed to everybody, and if you do not get one, please look for it and fill it out before you leave, so that we may have what data you possess.

In addition to that, there are certain other data wanted, and we have compiled two forms which will be completed shortly. One of these forms is an attempt to get poliomyelitis statistics from the States by months and by counties since 1910. That, I presume, will be mailed to you if the meeting approves of the form.

The other is a form for the collection of poliomyelitis statistics by periods, with the details concerning sex and color. We thought we could get those data, and it would be very important to us right now.

Finally, there is the form which was adopted in 1911 by the health authorities, copies of which I desire to distribute so that we can run over it quite rapidly. This is a case report which was gotten up in 1911 in order to standardize and make more uniform the data collected with reference to poliomyelitis in each State. Some slight changes which I will run over in a minute have been made by the committee. I wish to make it plain that this case report is for use in individual States where the health officer desires to make more detailed studies of particular cases. I do not believe that the Public Health Service has any method of receiving all reports and tabulating data. It would be a very large job which we at present have not the machinery to handle. This form is distributed with the idea that if the State wants to study the individual case, this is the form to be used, and then the data are all comparable on the same basis. We thought it better that the conference should run over this, so that any changes suggested could be made.

The second line indicates by check whether the case is paralyzed or abortive. The first page remains just as it is. I would like everybody to look that over and see if they have any suggestions to offer. Then we have the patient's name, age, and sex, nationality of father and mother, occupation of father and mother, residence, post office, and county. Does patient live in city, village or country? If in country, state distance from center of nearest town or village. Status of family; well to do, moderate, poor? Sewage disposal, flush closet, cesspool, privy? General sanitary conditions; excellent, good, fair, bad? Previous general health of patient; excellent, good, poor? Had patient suffered from any illness, indisposition, or accident within a month prior to this attack? Nature of illness or accident.

OTHER MEMBERS OF FAMILY (INCLUDING GUESTS, BOARDERS, AND SERVANTS).

Children: {Males (age of each)_____ Females (age of each)____ Adults: {Males, number_____ Females, number_____

Were there any other cases of sickness in the family within one month before or after this attack? _____

Give name, age, sex, date, and nature of each case?_____

_____

SYMPTOMS OF ACUTE STAGE.

Fever: High, moderate, slight, none?_____

Headache: Severe, moderate, slight, none?_____

Constipation, diarrhea, vomiting, sore throat?_____

Pain, distribution? _____

Tenderness, distribution? _____

Retraction of head, restlessness, drowsiness_____

That page stands as it is, with the exception that the second line is placed elsewhere.

On the next page the first line is inserted, "Type of case, abortive or paralyzed." We took that from the head of the first page and put it in this place on the second page.

Then that page continues:

Date of onset of acute symptoms_____

Date of onset of paralysis_____

Distribution of paralysis at its worst_____

What treatment was employed, and with what apparent results—

(*a*) In acute stage_____

(*b*) Subsequent to acute stage_____

Then there is added "With special reference to restoration of motion."

Then we have:

OUTCOME OF CASE TO DATE.

Recovery (complete disappearance of paralysis)_____

Improvement, extent of paralysis remaining_____

Death, date _____

CONTACT WITH PREVIOUS CASES.

Then there has been added "Date when previous case occurred."

Then, with two additions, it continues as follows:

Had patient been associated with any previous case? If so, state whether paralyzed or abortive; give name, address, and date_____

1. Had patient or member of family visited any place?_____

2. Had any visitor been to see family?_____

Did patient attend school?_____ Where?_____ Grade_____

What were the weather conditions immediately preceding this attack? Hot, mild, cold, wet, dry, dusty, unusual in any respect_____

Have any infective diseases, respiratory or digestive troubles, or unusual disorder of any kind been unusually prevalent in the community?_____

What animals or fowls were kept on the premises within month preceding attack?_____
Has there been any paralysis of animals or fowls in the vicinity?_____
What preventive measures were carried out?_____
Remarks: Please state any other facts of interest concerning the case_____
Date of filling out report_____

Signed_____, M. D.,
Address_____.

Dr. WOLFF. I should like to add to that "Was there any intimate contact with such animals on the part of the patient?"

Dr. LAVINDER. Has anybody anything further? You understand, in getting up this blank form, we wanted to make it as simple as possible, and we eliminated certain things. If you were to multiply the questions, you would not get any result at all. We felt that this was the maximum; the best we could do. There was no other change made, except that the address was added under the signature. Now it is suggested that we make a question as to whether there was contact with fowls or animals.

Dr. HOFFMAN. I would suggest that you indicate the race, and that you substitute the word "nativity" for "nationality."

Dr. LAVINDER. That was a subject of discussion with us, and we decided to omit it.

Dr. HOFFMAN. Why should you want to omit the race?

Dr. RANKIN. You would have to have the race in the South.

Dr. HOFFMAN. As to race, white or black.

Dr. LAVINDER. Yes. We discussed that question, and we felt we would not be justified in inserting it.

Dr. HOFFMAN. The statement was made by Dr. Emerson that it was thought for a while that among the negroes in New York City they had no cases at all. That was not correct. It would have been of very great consequence if it had been true.

Dr. LAVINDER. You could put it "white or colored."

Dr. YOUNG. Were you here yesterday afternoon?

Dr. HOFFMAN. Yes. I refer to the first discussion in which the statement was made by Dr. Emerson. If that statement had been subsequently found to be correct, it would have been of great value.

Dr. TRASK. The trouble with the word "race" is that it is understood differently. Many think of the Malay and the Caucasian and the Mongolian when you use the word "race." Then, of course, some understand it as meaning nationality. If that information is desired, that is the best way to put it.

The CHAIRMAN. Let Dr. Lavinder finish his report, and when we come to the question of its adoption we can have the discussion.

Dr. LAVINDER. Dr. Drake suggested, and it seems to me it is not a bad idea, that we number each one of the questions on this blank, and

then we can attach an explanation as to what we desire by referring to the number of the question.

I should like to add a word or so that has no connection with the specific matter now under consideration, but which is more or less of an appeal to you personally. There are certain cases which leave infected centers, particularly in New York City, and go to other parts of the country, certain selected cases, in which the chronology is of enormous importance for the purpose of attempting to establish more or less definitely an incubation period. Yesterday Dr. Frantz, of Delaware, reported an instance of that kind. They are not all of value, but some of them are, and we in New York would be very glad to receive from anybody a detailed report of such cases, especial attention being given to exact chronology of events. We feel that those cases are of special importance with regard to establishing an incubation period, and if any of you have the information we would be very glad to get it. Finally it was suggested that this conference might appoint a standing committee on statistics with regard to either poliomyelitis or other diseases, so as to make them uniform.

That completes the report of the committee, with the exception of the discussion.

The CHAIRMAN. You have received the report of the committee. What is the wish of the conference? The chair will entertain a motion that the report of the committee be received.

(It was moved and seconded that the report of the committee as read be received.)

Dr. ROBERG. Mr. Chairman, if this report is adopted, I would like to suggest that in addition to this, on the reverse side, at the close of the blank, the differential diagnosis of infantile paralysis from other diseases in which there are meningeal symptoms be printed, with the view of helping in the filling out of these blanks. There are many diseases with symptoms which are with difficulty differentiated from poliomyelitis. I had a case of central pneumonia in which the examination did not indicate the lung symptoms, but the entire picture was typical of poliomyelitis. Two days later the lung symptoms could be identified as pneumonic. Now, a differential diagnosis or mention of those diseases which have meningeal symptoms, if placed in fine print in this report, would help many physicians in filling out these cards.

Dr. BLACK. I second the motion that before this be received it be adopted section by section.

The CHAIRMAN. With regard to what Dr. Roberg has just said, the chair would suggest that it would be better to attach to this blank a little pamphlet for the benefit of physicians bearing on the salient points in the diagnosis of the disease. I think that would serve a better purpose than to put it in the corner of the report in fine print.

Dr. KING. On the first page of this blank, under "Acute stage," there are two suggestions I should like to make. One of the questions discussed in this country and one of the things we have been led to believe with reference to poliomyelitis is that the secretions from the nose and throat carry the virus of the disease. Yet I find nothing under the true symptoms of the disease to indicate whether or not there has been, prior to the attack, during the attack, or subsequent thereto, any unusual nasal or throat discharge. In our study of poliomyelitis in Indiana, covering four or five years of more or less superficial investigation, the blank form which went out to the physicians requested information as to this predominant symptom. In more than 84 per cent of the cases studied personally there was a profuse perspiration, which could not be accounted for except as one of the rather prominent symptoms of the disease under consideration. I do not know that this has been true in the experience of others, but it was true in the Indiana cases. It occurs to me that under the head of "Acute symptoms" it might be well to have the data regarding this particular symptom. The two questions I would like to have you add are with reference to profuse perspiration, and whether nasal and throat discharges be present.

Dr. LAVINDER. I suggest that we take the first section and find out whether there are any changes to be made, and we will get along much faster.

The CHAIRMAN. I think that is a very good suggestion, and we will consider this section by section. Has anyone any suggestions to make regarding the first section; that is, down to "Other members of family (including guests, boarders, and servants)"?

Dr. LAVINDER. The second line is eliminated and placed in another place. There is "Patient's name, age, and sex. Nationality of father and mother." Now, it has been suggested that we add a suggestion there on color.

Dr. BLACK. I move that we put in there, "white or black."

Dr. DRAKE. If we are to incorporate that question as to race, I think it would be very much better to indicate it as it is indicated on the standard blank; that is, red, white, black, or Indian. That covers all the races.

Dr. SWARTS. Is it desired to discover the color of the skin of the patient, or the place he comes from? It seems to me it is the question of nationality that the collaborators want to get at, to determine the susceptibility of Germans, Irish, or Americans. It is not a question of whether the skin has a light color or more or less color. It is rather a question of nationality.

Dr. TRASK. It seems to me from what has been said that there are certain communities in special sections of the country having what is known as a colored population, and that in those sections the words

"white" and "colored" would be thoroughly understood, and will bring out the desired information; that under other circumstances the word "nationality" would perhaps come nearer giving you the information you desire, whether Italian, German, or Scotch. I would suggest in addition to the form as it stands that there be inserted "white or black," or "white or colored," in the line under nationality.

The CHAIRMAN. Without objection, the words "white or colored" will be inserted in this section.

Dr. BURKART. I move the adoption of the suggestion of Dr. Trask.

The CHAIRMAN. Without objection, it will be inserted.

Dr. HOFFMAN. I believe that the word "nationality" is wrong, politically and scientifically, and that the word "nativity" should be used. There is no use in carrying forward in a new plan of the Public Health Service an obsolete, senseless term. If a man is reported as an American citizen, his nationality is that of an American. If you take his nativity he may be by nativity a Frenchman, German, or Italian.

Dr. TRASK. Any way you do it you are going to get into trouble. It is not a question of the way you would like to do it, but the answers you are going to receive. I think if you say "nationality" the average person will say "German" if the patient is a German residing in the United States and an American citizen; on the other hand, if you say "nativity," you are going to get the place of birth. The person may be of a distinctly Teutonic family, or may be of Semitic origin, and still be born in Portugal. I think it is the lesser of two evils, and it will be for you gentlemen from your experience to answer these questions in the way that will give the more exact information.

I can not agree entirely with Dr. Hoffman. My impression is that you will get better information with the caption standing "nationality" than with it standing "nativity," and derive more nearly the information you want.

Dr. WOODWARD. Would not the word "birthplace" obtain the information you desire?

Dr. TRASK. That is the same as "nativity."

Dr. WOODWARD. That is understood, and that is all you want.

Dr. TRASK. The point is not to determine where a man was born, but whether he is a Teuton or a Scandinavian or a Greek or an Italian. That is the information you want.

Dr. WOODWARD. It seems to me, Mr. Chairman, you are going rather finely into the tissue functions of individuals when you try to ascertain whether the parent of this 5-year-old child was born in America. It hardly seems we are going to get anywhere on a trail

of that sort. The important thing is, practically, whether he is foreign in his instincts, foreign in his habits and in his mode of life.

The CHAIRMAN. That is the point.

Dr. WOODWARD. It is really the social status of the man we are interested in, rather than where he was born, because we want to determine whether the disease prevails throughout certain social groups.

The CHAIRMAN. What is the pleasure of the conference? Shall this word be "nationality" or shall it be "nativity"?

Dr. WOLFF. I move it remain as it is.

Dr. BURKART. I second the motion.

The CHAIRMAN. It has been moved and seconded that the word remain as it is. Without objection it is so ordered, and it will so remain.

Are there any further suggestions regarding this first section? If not, it will be considered adopted as read.

Will you proceed with the second section?

Dr. LAVINDER. "Other members of the family, including boarders, family, and servants."

Dr. BURKART. I move its adoption as read.

Dr. SWARTS. I second the motion.

The CHAIRMAN. Is there any discussion? Without objection it will be so ordered.

Dr. LAVINDER. The next section reads:

SYMPTOMS OF ACUTE STAGE.

Fever: High, moderate, slight, none_____
Headache: Severe, moderate, slight, none_____
Constipation, diarrhea, vomiting, sore throat_____
Pain, distribution_____
Tenderness, distribution_____
Retraction of head, restlessness, drowsiness_____
Pain on anterior flexion of spine_____
Type of case, abortive or paralyzed_____
Date of onset of acute symptoms_____
Date of onset of paralysis_____
Distribution of paralysis at its worst_____
What treatment was employed and with what apparent results—
(*a*) In acute stage_____
(*b*) Subsequent to acute stage, with special reference to restoration of motion_____
What preventive measures were carried out?_____

The CHAIRMAN. What is the pleasure of the conference with regard to this section?

Dr. SWARTS. How about the nasal and throat discharges and unusual perspiration?

The CHAIRMAN. That was a point brought up by Dr. King, I believe. What is the opinion of the conference?

Dr. LAVINDER. It seems to me we are simply multiplying particulars. In certain epidemics other symptoms may be dominant, and if you keep on that way you will get any number of headings in here. You might as well add diarrhea, etc. It seems to me we are simply multiplying details needlessly.

Dr. DRAKE. Just one suggestion occurs to me that I think we overlooked yesterday, and that is the incorporation here of the new diagnostic symptom, pain on anterior flexion of the spine.

Dr. LAVINDER. The blank now has "Retraction of head."

Dr. DRAKE. Well, it fits right well in there.

The CHAIRMAN. "Pain on anterior flexion of spine."

Dr. DRAKE. Yes.

Dr. WOLFF. Mr. Chairman, here is a disease of which we know practically nothing, and we are endeavoring to obtain information. This outline on these slips is to be distributed throughout the United States for the purpose of collating the information we have and distributing it not only to the Public Health Service but to the State health boards and to the medical profession at large. The idea is to determine from this net collation of information just exactly what the usual and the unusual symptoms of this disease may be, in order that a proper diagnosis may be made. A gentleman on the other side of the house, from Indiana, states that his experience has been that a large part of these cases of poliomyelitis are accompanied by sweating, and I think that it is as important to obtain information on that symptom as it is to obtain information about something that was mentioned here by Dr. Draper yesterday. Even though the report may be made a little long, it will be attended with information that will be valuable to the medical profession of the country.

The CHAIRMAN. The chair would suggest that with the circular, in the differential diagnosis which will accompany the blank, these unusual symptoms can be given prominence. It could also be requested that physicians make note of any unusual symptoms.

Dr. ROBERG. Why not leave a blank space for unusual symptoms in the report and give the physician an opportunity to insert of his own initiative and in his own way whatever he chooses?

Dr. BURKART. I notice there is no space for remarks in this circular.

The CHAIRMAN. There is a space for remarks at the bottom of the second page. It says "Remarks. Please state any other facts of interest concerning the case."

Dr. BURKART. Why under the sun will not the intelligent practitioner place it there?

Dr. KING. The true symptoms would be of general interest. It occurs to me that in the circulars we have of the Public Health

Service and those distributed by the State boards of health, together with articles in scientific magazines, it has been stated that the virus of this disease is conveyed by the discharges from the nose or throat. It does not seem that this is an unusual symptom or an unusual condition, and a form which goes from a conference such as this which omits any mention of that most important matter would hardly be considered as covering the entire ground. While I am entirely willing to omit mention of the profuse perspiration as not being a matter of general interest, I do think that this conference should provide some way to report concerning the discharges from the nose and throat.

Dr. MANNING. I think the subject is important enough to include, because there is hardly a case where these symptoms are not looked for, particularly by the general practitioner.

The CHAIRMAN. In just what way would you put that in?

Dr. MANNING. "The presence or absence of nasal discharge."

Dr. BURKART. "Had the patient exhibited unusual nasal and throat discharges prior to the attack?"

Dr. WOODWARD. I do not think that stress should be placed on the nasal and throat discharges any more than on the intestinal discharges, whether yellow or dark, or hard or soft.

Dr. LAVINDER. Dr. Woodward has suggested that we might cut out that latter section, and put it on a separate blank. I do not think we want to multiply clinical data on a chart of this kind.

The CHAIRMAN. The question is now on the adoption of the section as read, which is headed, "Symptoms of acute stage."

Dr. DOWLING. What about lumbar puncture? It seems to me that is the most important consideration, especially with the abortive cases.

Dr. LAVINDER. The spinal puncture is a clinical, laboratory procedure which is secondary to the other features we are endeavoring to incorporate in this blank. I would like to hear from Dr. Frost on this.

The CHAIRMAN. Dr. Frost, what is your opinion regarding placing in this blank the results of spinal puncture?

Dr. FROST. I think it would be very desirable. It had not occurred to us before. This blank was made up several years ago, before spinal puncture had become a regular diagnostic method.

The CHAIRMAN. Where would you put this, on the first page? Would you make it "Results of spinal puncture"?

Dr. FROST. Yes.

The CHAIRMAN. Is there objection to inserting this in the blank? Without objection it will be inserted, "Results of spinal puncture," on the first page.

Dr. WOODWARD. Mr. Chairman, coming to the matter of clinical histories in blanks of this kind, unless we are going to use the

clinical histories that appear on these blanks for the purpose of eliminating cases which according to our own judgment are not poliomyelitis, we are going to get very little benefit from the information furnished. I do not believe there is anyone here who would undertake to revise the diagnosis of the attending physician on the basis of any such history as would appear on this blank. On the other hand, if we are going to collect clinical histories for the purpose of aiding in the diagnosis of the disease, we have to reckon very profoundly with the personal status and experience of the man who files the report. There is no one here, I believe, who would undertake, on the basis of data collected in this manner, to write a treatise on the differential diagnosis of anterior poliomyelitis.

I am of the opinion that the less we require in the way of clinical history on this blank the better it will be, with the understanding that any community that desires to collect clinical information can do so on a separate blank. I much prefer to trust to the clinical histories being collected by the expert diagnosticians in the city of New York at the present time than I do to the information that will be collected by thousands of physicians under varying circumstances throughout the United States, collected on blanks sent out to be filled during the rush of busy hours or turned over to some assistant to complete. I hope we will not unnecessarily extend the clinical history, and it seems to me we might almost with advantage omit it.

Dr. SWARTS. If this is adopted I should like to know how I should answer the question, "Results of spinal puncture? Did it clinically relieve the symptoms by relieving the pressure, or did you find nuclear cells?" How are you going to answer that? What are you going to do with it?

Dr. WOODWARD. Leave it out.

Dr. BURKART. I do not see, then, how you can get much of value. When you get through with this you will have several thousand cases recorded in New York City. If this information is added it will tend to make the blank more complex and defeat the purpose for which it is intended.

Dr. ROBERG. I move that this section of the blank be adopted as reported by the committee.

(The question was taken, and the motion was agreed to.)

Dr. BURKART. That is without the introduction?

The CHAIRMAN. Yes; without the introduction.

Dr. BURKART. Does that include the pain on anterior flexion of the spine?

The CHAIRMAN. That is at the bottom of the first page. Is there a second to this motion?

(The motion was again seconded, and the question being again taken, the motion was carried.)

Dr. BURKART. Does that include the two lines on the other side?

The CHAIRMAN. Yes; that was in the committee's report.

Dr. LAVINDER. The next section is:

OUTCOME OF CASE TO DATE.

Recovery (complete disappearance of paralysis)_____
Improvement, extent of paralysis remaining?_____
Death, date_____

Dr. HOFFMAN. I would suggest that after "death" you say first "immediate cause," and "primary cause," and second, "contributory cause." In the subsequent investigations of this disease it may be possible to ascertain what contributory causes occurred at the time of death. I would further suggest that you add a new line there, asking whether the diagnosis was confirmed by autopsy or not.

The CHAIRMAN. Are there any further suggestions regarding this section?

Dr. WOODWARD. With a view to retaining uniformity of nomenclature and in order to meet as far as possible the suggestions of Dr. Hoffman, I suggest that we might with advantage, under the term "death," use the phrases that are already in use in the standard certificate of death.

Dr. HOFFMAN. Yes; precisely.

Dr. WOODWARD. Insert there the phrases used in the standard certificate of death.

Dr. LAVINDER. That would not make a question at all, but just a direction.

The CHAIRMAN. Yes; just a direction. What does the conference think of this suggestion?

Dr. WATSON. I move its adoption.

(The motion was seconded.)

The CHAIRMAN. It has been moved and seconded that this section be adopted as read, including this question of the phraseology.

Dr. WOODWARD. Of the phraseology of the standard death certificate.

Dr. BURKHART. Just that phraseology.

(The question was taken, and the motion was unanimously agreed to.)

Dr. LAVINDER. The next section is "Contact with previous cases." The first question is, "Had patient been associated with any previous case?" Then there is inserted:

If so, state whether paralyzed or abortive case; give name, address, and date?__
Had any member of the patient's family been associated with any previous case?

If so, state whether paralyzed or abortive. Give name, address, and date.

Had patient or member of family visited any place? _____

2. Had any visitor been to see family? _____

Did patient attend school? _____. Where? _____. Grade? _____.

What were the weather conditions immediately preceding this attack? Hot, mild, cold, wet, dry, dusty; unusual in any respect? _____

Have any infective diseases, respiratory or digestive trouble, or unusual disorder of any kind been unusually prevalent in the community? _____

What animals or fowls were kept on the premises within month preceding attack? _____

Has there been any paralysis of animals or fowls in the vicinity? _____

What preventive measures were carried out? _____

Remarks: Please state any other facts of interest concerning the case_____

Date of filling out report_____

Signed _____, *M. D.*

Address _____.

Dr. WOLFF. Mr. Chairman, on the question, What immediate contact has patient had with domestic animals? I would say that there is a very widespread opinion among medical men that the domestic cat and dog have much to do with the spread of the disease, and in a circular of this character we would obtain an enormous amount of information in that regard which might turn out to be of inestimable value.

The CHAIRMAN. The Chair will entertain a motion for the adoption of this section.

Dr. BURKART. I move that the section be adopted, with the amendments inserted, as read.

Dr. WATSON. I second the motion.

(The question was taken and the motion was agreed to.)

Dr. SWARTS. The report, as a whole, now has to be adopted. I move that it be adopted as a whole.

(The motion was seconded, and, the question being taken, the motion was agreed to.)

(The blank which the conference finally adopted was as follows:)

[Treasury Department, Public Health Service, August, 1916.]

State of_____ Year_____ Case No_____

CASE REPORT OF POLIOMYELITIS (INFANTILE PARALYSIS).

(Form adopted by the conference of State and Territorial health authorities with the Public Health Service, Aug. 18, 1916.)

1. Patient's name_____; age_____; sex_____; color_____
2. Nationality of father (*a*)_____; of mother (*b*)_____
3. Occupation of father (*a*)_____; of mother (*b*)_____
4. Residence (post office)_____; county_____
5. Did patient live in city?_____; village?_____; country?_____
6. If in country, state distance from center of nearest town or village_____

7. Status of family: Well-to-do_____; moderate_____ poor_____
8. Sewage disposal: Flush closet_____; cesspool_____; privy_____
9. General sanitary conditions on premises: Excellent__; good__; fair__; bad__
10. Previous general health of patient: Excellent_____; good_____; poor_____
11. Had patient suffered from any illness, indisposition, or accident within a month prior to this attack?_____
12. Nature of illness or accident_____

OTHER MEMBERS OF FAMILY (INCLUDING GUESTS, BOARDERS, AND SERVANTS).

13. Children: Males (age of each)_____; females (age of each)_____
14. Adults: Males, number_____; females, number_____
15. Were there any other cases of sickness in the family within one month before or after this attack?_____
16. Give name, age, sex, date, and nature of each case_____

SYMPTOMS OF ACUTE STAGE.

17. Fever: High_____; moderate_____; slight_____; none_____
18. Headache: Severe_____; moderate_____; slight_____; none_____
19. Constipation____ 20. Diarrhea____ 21. Vomiting____ 22. Sore throat____
23. Pain_____; distribution_____
24. Tenderness_____; distribution_____
25. Retraction of head_____ 26. Restlessness_____ 27. Drowsiness_____
28. Pain on anterior flexion of spine_____
29. Date of onset: Of acute symptoms (*a*)____; of paralysis, if any (*b*)____
30. Distribution of paralysis at its worst_____
31. What treatment was employed, and with what apparent results?
    (*a*) In acute stage_____
    (*b*) Subsequent to acute stage_____
32. What preventive measures were carried out?_____

OUTCOME OF CASE TO DATE.

33. Recovery (complete disappearance of paralysis)_____
34. Improvement_____; extent of paralysis remaining_____
35. Death_____; date_____
    (Follow standard death certificate in stating cause of death.)

CONTACT WITH PREVIOUS CASES.

36. Had patient been associated with any previous case?_____ If so, state whether paralyzed or abortive case_____; give name, address, and date of case_____

37. Had any member of the patient's family been associated with any previous case?_____ If so, state whether paralyzed or abortive_____; give name, address, and date of case_____
_____
_____
38. Had patient or any member of family visited any other community within one month prior to attack?_____ If so, give places visited and dates____
_____
39. Had patient's family received any visitors from other communities within one month prior to attack?_____ If so, from what places, and when____
_____
_____
40. Did patient attend school?_____; where?_____; grade_____
41. What were the weather conditions immediately preceding this attack? Hot_____; mild_____; cold_____; wet_____; dry_____; dusty_____; unusual in any respect_____
42. Have any infective diseases, respiratory or digestive troubles, or unusual disorders of any kind been unusually prevalent in the community?_____
43. What animals or fowls were kept on the premises within one month preceding attack?_____
44. Had there been any paralytic disorders of animals or fowls in the vicinity?
_____

REMARKS.—Please state any other facts of interest concerning the case:

_____
Date of filling out report_____
Signed _____, *M. D.*
Address _____.

The CHAIRMAN. I would suggest to the chairman of this committee that there is one point on which the committee has not reported, and that is as to the uniformity in stating the age period.

Dr. LAVINDER. That was in the other blank on the age period. There are two blank forms which have not come down.

The CHAIRMAN. Will you report on that?

Dr. LAVINDER. When it comes down; yes, sir.

Dr. RANKIN. Mr. Chairman, how long will it be before the Secretary of the State board of health will get a copy of this form?

The CHAIRMAN. I think we can send out typewritten copies almost immediately.

Dr. RANKIN. We would like to have them immediately.

The CHAIRMAN. And of course printed copies will be sent out later.

Dr. RANKIN. Then a motion is unnecessary.

The CHAIRMAN. We will arrange to have that done immediately. We wish all of the members to fill out this report on poliomyelitis before they leave.

It was suggested that a standing committee on the collection of poliomyelitis statistics be appointed by the conference. What is

the wish of the conference regarding this suggestion? Does the conference wish a standing committee appointed on the collection of poliomyelitis statistics?

(There was no response.) Evidently the conference does not. We will consider the matter closed.

Dr. Woodward. Mr. Chairman, I do not believe that we need a committee on poliomyelitis statistics, but it seems to me we might well have a committee on poliomyelitis. I move that the chairman appoint a standing committee of five to study the subject of poliomyelitis and to report to the conference from time to time as it may be convened.

Dr. Swarts. I second that motion.

The Chairman. It has been moved and seconded that the chair appoint a committee for the purpose of studying and reporting from time to time to the conference on the subject of poliomyelitis. Is there any discussion?

(The question being taken, the motion was agreed to.)

Dr. Lavinder. These other two blanks are put on one page and they will be properly arranged later. This gives the distribution of cases by ages, sources, and by States, counties, and so on. It will go on two forms, presumably. I will distribute these copies.

The Chairman. The conference will now receive the report of the committee on measures to prevent the intrastate and interstate spread of poliomyelitis. Dr. John S. Fulton.

REPORT OF THE COMMITTEE ON INTERSTATE AND INTRASTATE SPREAD OF POLIOMYELITIS.

Dr. Fulton. Mr. Chairman and gentlemen of the conference, your committee appointed yesterday to consider the interstate and intrastate spread of poliomyelitis met the afternoon of the same day and undertook to make as condensed a statement as it could, covering the vital points of the situation, but by no means exhausting the details of prevention of the spread of the disease. The committee has put forth certain minimum requirements and certain statements of principles and of practices. At the present moment only six copies of the report are available, but additional copies are being prepared and will soon be ready for distribution. I will ask you to pay very close attention to the reading:

REPORT OF THE COMMITTEE ON MEASURES FOR THE PREVENTION OF INTERSTATE AND INTRASTATE SPREAD OF POLIOMYELITIS.

I. It is the sense of this committee that the first step proper to be taken by a State health authority, believing its territory to be in danger of an invasion by poliomyelitis from another State or part of a State, is to call the attention of

the United States Public Health Service to the situation believed to be dangerous, and to request the United States Public Health Service to take whatever steps are necessary to prevent the interstate spread of poliomyelitis.

II. The necessary steps, ordinarily to be taken by the United States Public Health Service in such a contingency are believed to be:

(1) Investigation of the infected area.

(2) Notification concerning the removal of persons, 16 years of age or under, from an infected area to a named point of destination in another State, said notification to be addressed in every case to the State health authority of the State of destination.

(3) The forms of notification and of health certification and of permits to travel should include the following information and specifications, with such additional information and specifications as the United States Public Health Service deems necessary:

> Identification of each traveler, the exact location of present or usual residence, and record of premises as to freedom from poliomyelitis during the preceding three months; or as to latest date of infection if less than three months; or as to renovation or cleansing of premises after infection.

(4) Permits to travel shall be void unless the journey shall begin within 24 hours after issue of the permit.

(5) Single permits shall not be issued for several persons, except for family or household groups coming from the same domicile.

(6) The collection of fees, by health officials, from applicants for permits, whether resident or nonresident, should not be permitted.

(7) The certificates of private physicians will not alone be a sufficient basis for the issue of a permit to travel. Permits for interstate travel will be based on medical examination.

(8) Permits for interstate travel should be signed by an officer of the United States Public Health Service, or by the State health officer, or by an officer authorized by the State health authority.

III. The committee disapproves quarantine by one State against another State, or quarantine by one community against another community in the same State. It is believed that the Federal Government, through the United States Public Health Service, can perform all the duties of notification and certification required in interstate relations in case of unusual prevalence of poliomyelitis, and that State health authorities can and should perform like services as between communities in the same State during unusual prevalence of poliomyelitis.

IV. It is recommended that all cases of poliomyelitis should be reported immediately to the local health authorities and to the State health authorities, and that State health authorities make weekly reports to the United States Public Health Service of all cases of poliomyelitis. The United States Public Health Service is asked to furnish general reports weekly.

V. It is recommended that all persons 16 years old or under, with a clean bill of health, and removing from an infected area or district to another locality should be kept under medical observation daily for two weeks from the date of the certificate.

VI. It is believed that the period of isolation of a case of poliomyelitis should be not less than six weeks from date of onset.

VII. The isolation of cases of poliomyelitis should be stringent isolation of the sick person with attendant or attendants, in a properly screened room or rooms, with disinfection at the bedside of all bodily excretions. Wherever it is possible the removal of patients to a hospital is greatly to be preferred to isolation in a private house or apartment.

VIII. In case of death from poliomyelitis the funeral should be strictly private.

IX. Wherever poliomyelitis is unusually prevalent, assemblages of children in public places should be prohibited.

X. During unusual prevalence of poliomyelitis, schools should not be opened without thorough medical supervision by a health authority. When schools are opened, beginning should be made with high schools, and proceeding to lower age groups no more rapidly than complete medical examinations can be made.

XI. Because of the existence or unknown carriers of the infectious virus of poliomyelitis and because the infectious virus is present in the body discharges of such persons, therefore all measures to prevent contamination by human excreta or other bodily discharges, the suppression of the fly nuisance, prohibition of the common drinking cup, and a general educational campaign for cleanliness and sanitation, with particular instruction of parents and children concerning personal hygiene, especially of the mouth and nose, are strongly urged by the committee.

XII. To aid in preventing the spread of poliomyelitis, common carriers should instruct their agents and ticket sellers, by direct order as well as by public notices, when poliomyelitis is unusually prevalent, that travelers with children of 16 years or under must be provided with a health certificate as detailed in another section of this report.

XIII. The epidemic prevalence of poliomyelitis in certain States at this time indicates a probability of epidemic prevalence next year in States not gravely affected at the present time. It is believed that the measures here recommended should be continued in operation at least until such time as the incidence of the disease has subsided to or below its usual level.

JOHN S. FULTON.
T. D. TUTTLE.
H. M. BRACKEN.
ENNION G. WILLIAMS.
CHAS. E. BANKS.

Dr. FULTON. This report was framed, Mr. Chairman, with the hope that it would not be accepted without thorough and free discussion, and also in the hope that if possible it will be adopted without amendment, or at least without extensive amendment. The committee, I think, has undertaken to come right down to basic principles in solving the vital problem that confronts us. Some things are desirable to be done in extension of practices here recommended, but I think certainly not in abbreviation of the details outlined.

Dr. BLACK. Mr. Chairman, I move that the report be adopted as read.

(The motion was seconded.)

Dr. COLLINS. Under the head of distribution of the disease a question arises which has not been mentioned, I believe, and that is as to the shipping of dead bodies from point to point; whether that should be allowed, and if allowed, under what conditions.

Dr. BURKART. That is provided for in every State through an embalmers' law.

Dr. COLLINS. Yes; but in this particular disease it is not.

Dr. SWARTS. We have not time this morning to go into that discussion. A good many of us want to get away at an early hour, and if we take up the subject of the transportation of the dead there is no telling how long we will be here. I move that the question be left until the next conference.

Dr. BLACK. While I moved the adoption of this report and am thoroughly in favor of it, there are certain matters in regard to which I should like to know what action will be forthcoming. In certain ports of entry as many as 2,000 New York children have arrived in one week from infected areas. We recommend examination, registration, and observation; but it is obvious that this is impossible for 20,000 or 30,000 or even 10,000 persons without great expense. I think many of the local authorities have the power to adopt more stringent regulations than are adopted by the State board of health. Now, if they decide to act without the advice of the State board of health, what is the State to expect from the Federal authorities if they should take such action?

Dr. WOODWARD. I move that the report be read section by section and discussed in that manner.

Dr. RANKIN. I second that motion.

(The question was taken, and the motion was agreed to.)

The CHAIRMAN. It is so ordered. Dr. Drake will read the first section.

Dr. DRAKE. The first section reads:

1. It is the sense of this committee that the first step proper to be taken by a State health authority believing its territory to be in danger of an invasion by poliomyelitis from another State or part of a State is to call the attention of the United States Public Health Service to the situation believed to be dangerous and to request the United States Public Health Service to take whatever steps are necessary to prevent the interstate spread of poliomyelitis.

I move the adoption of that section.

(The motion was seconded, and the question being taken, the motion was agreed to.)

The CHAIRMAN. It is carried. The second section reads:

II. The necessary steps ordinarily to be taken by the United States Public Health Service in such a contingency are believed to be:

(1) Investigation of the infected area.

(2) Notification concerning the removal of persons, 16 years of age or under, from an infected area to a named point of destination in another State, said notification to be addressed in every case to the State health authority of the State of destination.

(3) The forms of notification and of health certification and of permits to travel should include the following information and specifications with such additional information and specifications as the United States Public Health Service deems necessary:

Identification of each traveler, the exact location of present or usual residence, and record of premises as to freedom from poliomyelitis during the preceding three months; or as to latest date of infection if less than three months; or as to renovation or cleansing of premises after infection.

(4) Permits to travel shall be void unless the journey shall begin within 24 hours after issue of the permit.

(5) Single permits shall not be issued for several persons, except for family or household groups coming from the same domicile.

(6) The collection of fees, by health officials, from applicants for permits, whether resident or nonresident, should not be permitted.

(7) The certificates of private physicians will not alone be a sufficient basis for the issue of a permit to travel. Permits for interstate travel will be based on medical examination.

I am not clear as to that.

(8) Permits for interstate travel should be signed by an officer of the United State Public Health Service, or by the State health officer, or by an officer authorized by the State health authority.

Dr. BURKART. What is the point you said you were not clear upon?

The CHAIRMAN. It is not entirely clear as to the latter part of subsection 7, which says, "Permits for interstate travel will be based on medical examination." Does that mean really a medical examination?

Dr. FULTON. I would be glad to hear anybody suggest a substitute for that.

The CHAIRMAN. To give a man a medical examination requires time. I would suggest that it should be medical "inspection" instead of "examination." I would be glad to hear from Dr. Banks on this subject.

Dr. BANKS. The idea we had in mind was that the officer issuing the permit should make the inspection or examination.

The CHAIRMAN. Is it agreeable to the committee to substitute "inspection" for "examination"?

Dr. BRACKEN. What were the words, "medical inspection"?

Dr. BANKS. They were "medical examination." A medical inspection is an examination.

Dr. FULTON. Dr. Tuttle, how does this strike you, "inspection"?

Dr. TUTTLE. All right.

The CHAIRMAN. Is there further discussion of this subject?

Dr. RANKIN. I move the section be adopted.

The CHAIRMAN. Is there any discussion?

Dr. YOUNG. I do not know how many tourists we receive, but we have about 20,000. This would throw quite a large burden upon the health officer, to do all the work of making out certificates, and he receives nothing for it.

Again, in the northern and central parts of our State in the wild woods toward Moosehead Lake, we have two very large hotels. There

is just one physician near there. The country is wild, unorganized, and there are no health authorities. The doctor has a commission from the State board of health as a sort of sanitary watchdog or inspector. Supposing that I should delegate this man up there at Kineo to issue certificates, it would throw quite a burden of work upon him, and he receives no fee. I would suggest whether it might not be better, instead of making an absolute prohibition of taking fees for this service, to say what the maximum fee shall be, perhaps 25 cents.

Dr. BURKART. Oh, no.

Dr. FULTON. I should like to say that I would object to any change in the verbiage, for this reason. I think that an amendment of that sort would imply a greater force in this whole document than actually exists. In some parts of the country, abuses are sure to eventuate from the collection of fees. We are not writing here a law that is going to be approved by the governor of a State, but we are expressing an opinion, and a very decided opinion, about the collection of fees. I do not conceive that that would in any wise embarrass Dr. Young in the very peculiar and unusual situation he has there, and if we should attempt to make provisions here for very unusual circumstances, outside of extreme probability, we will meet with all sorts of difficulty.

Dr. KERR. I would like to suggest that at some time during the discussion the act of February 15, 1893, be read.

The CHAIRMAN. The chair will read that act now, and there are copies of it here available for distribution. Beginning on page 8 of the interstate quarantine regulations, section 3 of the act reads as follows:

SEC. 3. That the Supervising Surgeon General of the Marine-Hospital Service shall, immediately after this act takes effect, examine the quarantine regulations of all State and municipal boards of health and shall, under the direction of the Secretary of the Treasury, cooperate with and aid State and municipal boards of health in the execution and enforcement of the rules and regulations of such boards and in the execution and enforcement of the rules and regulations made by the Secretary of the Treasury to prevent the introduction of contagious or infectious diseases into the United States from foreign countries, and into one State or Territory or the District of Columbia from another State or Territory or the District of Columbia; and all rules and regulations made by the Secretary of the Treasury shall operate uniformly and in no manner discriminate against any port or place; and at such ports and places within the United States as have no quarantine regulations under State or municipal authority, where such regulations are, in the opinion of the Secretary of the Treasury, necessary to prevent the introduction of contagious or infectious diseases into the United States from foreign countries, or into one State or Territory or the District of Columbia from another State or Territory or the District of Columbia, and at such ports and places within the United States where quarantine regulations exist under the authority of the State or municipality which, in the opinion of the Secretary of the Treasury, are not sufficient to prevent the introduction of

such diseases into the United States, or into one State or Territory or the District of Columbia from another State or Territory or the District of Columbia, the Secretary of the Treasury shall, if in his judgment it is necessary and proper, make such additional rules and regulations as are necessary to prevent the introduction of such diseases into the United States from foreign countries, or into one State or Territory or the District of Columbia from another State or Territory or the District of Columbia, and when such rules and regulations have been made they shall be promulgated by the Secretary of the Treasury, and enforced by the sanitary authorities of the States and municipalities, where the State and municipal health authorities will undertake to execute and enforce them; but if the State or municipal authorities shall fail or refuse to enforce said rules and regulations the President shall execute and enforce the same and adopt such measures as in his judgment shall be necessary to prevent the introduction or spread of such diseases, and may detail or appoint officers for that purpose.

The remainder of the section is not pertinent to the subject under discussion, and will therefore not be read.

Dr. PORTER. Mr. Chairman, while it is a fact that this section may apply in a general way to communicable diseases throughout the United States, it is also a fact that this law was passed after the great epidemic of yellow fever; I think it was in 1905——

The CHAIRMAN. This was in 1893.

Dr. PORTER. Well, then, in 1888.

The CHAIRMAN. Yes.

Dr. PORTER. I know in a general way it is applicable to all communicable diseases, yet it was especially directed at that time at yellow fever. If it is true that it can be made to apply to all communicable diseases from one State to another, then there is no work for this conference to do. The whole matter is in the hands of the Public Health Service to take charge of.

Dr. BURKART. Is it not a general inference of the common law that in the absence of a prohibitory enactment this law stands? There is nothing which says that it shall not apply to all dangerous communicable diseases. If there is nothing said to the effect that it shall not apply, certainly it must apply.

Dr. TRASK. The law of 1893 provided that the existing regulations of States and municipalities should be examined to ascertain whether they complied with a given standard of efficiency. This implied a degree of confidence in and the placing of responsibilities upon the State and local authorities. The same law provides that the State and municipal authorities shall enforce any regulations which may be promulgated to prevent the interstate spread of disease if they will do this voluntarily. This also shows the important part which it is intended the State authorities shall take in the enforcement of the provisions of the law and of any regulations which may be made pursuant thereto.

In regard to the law of 1902, which specifically provides for conferences of the State health authorities with the Public Health Service, there seems to be no reason to doubt that those who drafted the law and the Congress which adopted it were conversant with the provisions of the act of 1893 and the provisions of its section 3, and that the conferences were provided for in the later law with full knowledge of and having in mind the provisions of the act of 1893. These points are brought out because it is believed that they indicate that the provisions of the section read by the chairman and the provisions of subsequent laws emphasize the importance of this conference and its necessary relation to the interstate control of disease, and particularly to the discussion of such matters as that for which this conference has been called.

Dr. Woodward. I move that we return to the regular order.

The Chairman. The Chair was about to remark that we are straying from the subject of discussion. There is a motion before the conference for the adoption of section 2, and this is under consideration. Gentlemen will please confine their remarks to the discussion of the motion before us.

Dr. Drake. I rise for information. I should like to know what the life of each of those certificates would be? What is the period of time that the certificate is good for, for purposes of travel?

The Chairman. It is good until the end of the journey.

Dr. Fulton. Do you mean the certificate or permit?

Dr. Drake. The permit to travel.

Dr. Fulton. The beginning of the journey must occur within 24 hours from the date of the issuance of the certificate. The certificate itself is to be sent by the Public Health Service directly to the health officer at the point of destination, after which time the health authorities assume their function. As to the life of that certificate, it is certainly not intended that the certificate shall be used for more than one journey. As a certificate, it is invalid when the journey is completed.

Dr. Drake. I should also like to ask how this requirement relates to suburban travel. There are several hundred thousand people who travel to suburban points every day. Are they going to be required to have certificates for that purpose? Some of those communities are infected points.

Dr. Fulton. That is one of the things that the committee thought it ought not to venture into, the handling of commuters, week-end excursionists, and the movements of persons engaged in certain industries, such as the canning industry. This committee did not think it was able to handle questions of that sort. Those are matters which, we think, should be left untouched, because they can be decided much better by local authorities.

Dr. Drake. Then one other question I wish to ask——

Dr. Banks. In relation to the manner in which commuters leaving New York City are cared for, it is by issuing seven-day certificates to boys—they are mostly boys who are engaged in office work—between Jersey City and points in New York City. We issue to them a travel card lasting one week.

The Chairman. The conference will note that this applies to children under 16 years of age, and not to regular adults.

Dr. Dowling. There are a number of people who go from Bay St. Louis to New Orleans. Then there are many people who go from New Orleans on Friday and come back on Monday evenings.

Dr. Drake. Inasmuch as a large number of the health authorities in the small communities in our State are not medical men, and therefore would not be considered competent to make this health inspection and issue the certificate, another difficulty arises.

Dr. Bracken. This certification is necessary only from those places where infantile paralysis prevails, so that you would not have to appoint many thousands for a State. The whole intent of this clause is to protect the State officials in doing their business. The point is that if we do not put in there State or local health officers we will encourage certification by a lot of inferior men, men whose certificates we would not want to see accepted, interstate or intrastate.

Dr. Drake. One or two other points. Is it the purpose of this conference to issue a uniform type of certificate, or is it left to the individual States to issue the certificates they see fit, incorporating the items recommended by the committee?

Dr. Fulton. It is confidently believed that with the adoption of these regulations a uniform certificate, recognizable at a glance as authoritative, will come into existence. We could specify that it should carry a seal of an authoritative character as a guaranty, I think, as much as it is right for this conference to undertake to guarantee them. Such was our intention.

Dr. Drake. Would it not be well for the United States to issue its own certificate? Then, one other question. Of course this is only where there is a child under 16 years of age. I believe it is generally assumed or generally acknowledged that the adult may be a carrier as well as a child. Are you going to permit adults from infected premises to travel on health certificates?

Dr. Fulton. The committee accepted the limit of 16 years, since it is current practice at this time. It in no way restrains the powers or the rights of local authorities to make a limit beyond that if they desire.

Dr. Frost. Mr. Chairman, I certainly hesitate to throw any further complications into such an intricate situation as this, but the question that has just been raised does seem pertinent. I think this

conference, in adopting any regulations which require so much work and machinery, might look into what may be accomplished in the prevention of the spread of the disease. Now, if we are working on the assumption that poliomyelitis is a contagious disease, an inevitable corollary, therefore, is that we have adult carriers who are the major factors in the spread of the infection. I think the facts and figures will show that the exclusion of children under 16 will cover only a very small part of the problem. They constitute only a small fraction of the total travel. We have no reason to believe that they are more dangerous as carriers than adults; and how much of the problem are we really covering when we are excluding children under 16? I recognize, of course, that there are certain considerations of policy and practicability; but might not that be a subject, anyhow, for consideration and discussion?

Dr. Woodward. It seems to me, Mr. Chairman, that the reason stated by Dr. Fulton for adopting the 16-year limit is the very reason why we should not adopt it. Dr. Fulton says we are to adopt it because it is current practice. We know it is current practice; but who is there here who can show that the issuance of these certificates based on an age of 16 years as a limit has prevented the spread of the disease in the least? I do not believe there is any evidence that it has done so; and if that is the case, we must either have the courage of our convictions or stultify ourselves before the public. We must have some sound basis for the age limit. Dr. Frost has already said that the number of children in interstate traffic is small. There is another reason why we may say, relatively, that the children are a safer element in the travel problem than adults; that is, by reason of their susceptibility to the disease. The child in interstate travel comes down with the disease, and the condition is recognized and the child is quarantined, while the adult is never discovered. I believe the age limit ought to be abandoned altogether, and we ought to enforce these regulations against the entire body of the community or ought not to undertake to enforce them at all.

Dr. Rankin. That is right, exactly.

Dr. Fulton. As chairman of the committee, I do not feel in anything like the degree Dr. Woodward has expressed, that we should as one alternative do nothing, or as the other, take off the age limit entirely. We have proceeded upon the basis of experience in this present epidemic, and certainly I would not dare assert, as it has been asserted here this morning, that the specification of this limitation of the age of 16 has been of no profit. I think a man makes an unwarrantable assertion in saying such a thing as that. I conceive that this limitation has done good and will do good, and I will say also that I think there is no sound reason for raising

the limit at the present time. The committee does not intend to make any departure from that which experience seems to us to have justified, and which certainly has the sanction of authority. It leaves this conference quite free to extend the age limit if it desires. In my own judgment this extension is not warranted, because it would result in some of the confusion which we are trying if possible to avoid. I do not feel that this section would be improved by altering the age limit. I am also inclined to think that there is some tendency to exaggerate the potentialities of adult carriers, and I consider that the restriction of the movements of persons who are at the susceptible age the most important desideratum. I also call attention to the extreme difficulty of recognizing adult carriers.

Dr. Hoffman. I rise with great reluctance, but I feel very strongly with Dr. Woodward that the age limit of 16 years is arbitrary, unjustifiable, and can not be sustained. I have here references of 1,200 cases that show there were practically no deaths whatever above the age of 14 years. It shows there were more deaths at 14 than at 15, 16, or 17. Why should the line be drawn at 16 years? We have to admit that it does not make much difference whether the age limit is 7, 8, 9, 10, or 11, or 12. I have a boy now held in a two weeks' quarantine, who went from New Jersey to New York. We traveled without interference under a certificate, and nobody even looked at the document. That certificate is over a week old, and it is not stamped, and it does not mean anything except that it has a place upon it for a stamp. Yet that boy of mine is being kept at home and can not travel because he is not quite 16 years of age. I suggest that you draw the line at 14 years of age if you draw it at all.

Dr. Leake. I support strongly what Dr. Hoffman says, that there is no reason for drawing an age limit.

Dr. Rankin. Mr. Chairman, I am in full sympathy with what Dr. Woodward said, and also with what Dr. Hoffman has said. Now, when the health officer goes in and recommends certain measures, and people adopt those measures, they look to that officer for results. I, for one, do not believe that the present method of handling this epidemic is worth anything, hardly. I do not know what the literature will show, but they had an epidemic several years ago in New York when few of these measures were taken and they did not have near the susceptibility that they have to-day, with all the measures adopted. I expect that an investigation of all the epidemics in the country would show that there is no higher incidence where practically nothing is done than in those cases where they take all these pains.

It amounts to this, that I must go back to the people and say to them, "I can not control this disease without the control of all possible carriers, and that means 400 or 500 people in these towns up here. Do you folks want me to do that? If you do, pass this law. If you do not, understand that I wash my hands of it." That is just the situation. We go and recommend something that does not get results; and what health officer in this audience would feel easy with the present methods of managing infantile paralysis? Either that, or we go before those people and say, "Here, we can not control the disease because there are more carriers than sick people. Now, the only possible way for you folks—not me—to control this outbreak is to quarantine all of them, all possible suspects, adults, and children alike." As the situation now stands in this country the people are placing the responsibility of failure to stop the disease upon the health officers, and that is what they have a right to do, if we keep on with the present methods. We have got to tell them that those methods are not getting results, and that the only methods that will get results are very stringent and radical, thus throwing upon them the responsibility of declining the more radical measures.

Dr. Banks. Mr. Chairman, so far as my experience goes we are under no delusion that the notification system which we have adopted will prevent the spread of poliomyelitis, unless the health officers do their duty after we have notified them. That is the purpose of the whole system, and the assumption of an arbitrary age is one that can be changed if deemed proper. We said 16. If it is the wisdom of the conference that it should be 14, that is to be accepted. This system is not one of quarantine; it is merely one of regulation of traffic, and to undertake the control of adults would involve practically a quarantine of the entire country. You have got to stop somewhere in a system of this sort which singles out a class of persons who are affected directly by the disease.

Dr. Woodward. But, Mr. Chairman, does not Dr. Banks see that if it is safe for an adult to come from a sick room and go into interstate travel without restriction, or to come from an infected house and go into interstate travel without restriction, we must absolutely lay down the same rule with respect to his conduct in his own community? We can not say to this man who is living in a placarded house, "Come, you are 16½ years old. Take this car and go down to this picnic," simply because he is over 16 years old. If we undertake to fix the limit at 16 for travel, we must fix it at that age for all purposes.

Dr. Banks. Mr. Chairman, it seems to me that the local health regulations regarding infected places and infected families cover such instances. Persons coming from infected houses can not go out without defiance of the law.

Dr. Woodward. That is the point. The disease recognizes no difference between interstate regulations and local regulations, and we can not logically waive the age limit for national purposes and establish it for local purposes. Such an assumption would be utterly unjustifiable on any scientific principle or logical basis.

Dr. Fulton. Do you state that as a lawyer, Dr. Woodward? I do not conceive that the local authorities are limited in their power to make regulations as to internal movements. I should not hold that view myself as a health officer.

Dr. Woodward. I thought I tried to make it definitely understood that it was within the power of the local boards to do.

Dr. Fulton. Yes.

Dr. Woodward. And I think the record will sustain me in that. The point I make is that, whatever their power may be on the basis of the law, that on the basis of facts they will find nothing to sustain them. They have local authority to do a great many things that science and logic do not justify.

Dr. Kerr. Mr. Chairman, it seems to me I might perhaps interpret for the bureau the object of the work that is going on. There appears to have been some misunderstanding of the proposed or presumed value of the work. We start out in public-health work with the assumption that knowledge is a valuable thing—knowledge of the geographic occurrence and prevalence of disease. We are collecting death and case reports from all over the country, and that has been a practice for many years. We are not doing it with the object of guaranteeing that we, or the health officers cooperating with us, will relieve the people of the presence of disease. I think all the officers here feel that the work at New York is just a little more acute method of furnishing information to State and local health authorities for such use as it is possible in the present state of our knowledge for them to make of it. It must not be assumed in furnishing these certificates that we guarantee the persons free from poliomyelitis.

As I understand it, the certificates mean simply that those persons to whom they are issued have come from a certain place and are going to another place, and this information is furnished in order that the local health authorities may be on the lookout. I think that we should be entirely frank with ourselves and with the public as to what we expect to accomplish. In my judgment the situation is not as serious as it might be, but we have got to face it together, and we must take the public into our confidence and make the best of it. I feel that the question at the present time, therefore, whether a frank system of notification, such as has been inaugurated and carried on thus far, is of service to State and local authorities or not, is the primary question to be settled here. If it is not of service, it seems

to me it would not be a good plan for this country to adopt it generally. If it is a good plan, then, by all means it seems to me that the notification system should include all infected localities, and be participated in by the Federal, State, and local authorities who are a part of the national health service. For that reason I suggested that the section of the law pertaining to this subject be read.

Dr. PARLETT. Mr. Chairman, by restricting the travel of those under 16 years of age, do we not at least protect those at the susceptible age from possible contraction of the disease, and those with whom they come in contact at the point of destination who are of susceptible age? Do we not, therefore, at least to some extent, modify the spread of disease?

Dr. BRACKEN. Mr. Chairman, it seems to me we are doing a lot of talking and are not getting anywhere. There are just a few words concerning the age limit that you are quarreling over. It seems to me, therefore, that some one should move to take out the age limit entirely, or to lower the limit. I am on the committee, and before I came down here Dr. Fulton said if I was not on the committee I would be raising a row all the time, so I will try to keep quiet.

Dr. SWARTS. I understand Dr. Woodward's point to be that the certificate will say, "This is to certify that Mary Smith, age 6 years, is free from infantile paralysis," and then that its parent, age 62, may be a carrier.

Dr. PORTER. How is he to know?

Dr. SWARTS. That is it—how is he to know? Therefore I would certify, "I can not certify as to the father. As to the father, you take your chances."

Mr. BANKS. I would like to suggest that in limiting the travel of children under 16 you also limit the parents and guardians who go with them. It is very rare that children travel alone.

Dr. BOUDREAU. I would like to protest against the expense that will be placed upon State departments of health if these notifications are sent to them and have to be forwarded to the health officers in the different localities. I think they should be forwarded to the State department of health, and the State department of health can discriminate and see that the notifications are looked after when the local health officer is not efficient. I know we have not the personnel in our State to look after that kind of work.

Dr. BRACKEN. I would ask if the doctor has been in official work very long; and if he has, how he would like discriminating between Dr. A. and Dr. B., 6 miles apart? I think he would find himself in a rather unpleasant situation.

Dr. WOODWARD. I would move to amend this section by striking out, under Section II, the words "sixteen years of age or under."

(The motion was seconded.)

Dr. BRACKEN. How will it read then?

The CHAIRMAN. It will then read:

Notification concerning the removal of persons from an infected area to a named point of destination in another State, said notification to be addressed in every case to the State health authority of the State of destination.

You have heard the motion. Are you ready for the question?

Dr. PARLETT. What is the purpose of it?

The CHAIRMAN. The purpose is to cover all persons.

Dr. PORTER. Then, do I understand that all persons living in New York City, of whatsoever age, must get a certificate?

The CHAIRMAN. It says, "from an infected area."

Dr. SWARTS. What constitutes an infected area, one case in a hundred?

Dr. FULTON. Oh, my; we do not go into that.

The CHAIRMAN. Are you ready for the question?

Dr. WILLIAMS. I would like to move as a substitute, that instead of leaving that out we insert "fourteen years or under"; so that we have three propositions, 16 or under, 14 or under, or to omit mention of any age limit. It seems to me it is impracticable to furnish certificates for everybody traveling out of New York City.

The CHAIRMAN. It has been moved and seconded that we substitute for the motion of Dr. Woodward the insertion of the words "fourteen years of age or under," so that subsection 2 will read, "Notification concerning the removal of persons 14 years of age or under," and so forth.

Are you ready for the question? This is, on the substitute for Dr. Woodward's motion.

(The question was taken, and the motion was not agreed to.)

The CHAIRMAN. The motion is lost. The motion now comes on deleting the words "16 years of age or under"; that is the motion of Dr. Woodward.

(The question was taken by a rising vote, and the motion was not agreed to.)

The CHAIRMAN. The motion is lost. The question now before the conference is on the adoption of Section II as a whole. Are you ready for the question?

(The question was taken, and the section was adopted.)

The CHAIRMAN. Section III of the report reads as follows:

III. The committee disapproves quarantine by one State against another State, or quarantine by one community against another community in the same State. It is believed that the Federal Government, through the United States Public Health Service, can perform all the duties of notification and certification required in interstate relations, in case of unusual prevalence of poliomyelitis; and that State health authorities can and should perform like services as between communities in the same State during unusual prevalence of poliomyelitis.

Dr. RANKIN. I move that the section be adopted.

(The motion was seconded.)

The CHAIRMAN. Is there any discussion? Are you ready for the question?

(The question was taken, and the motion was agreed to.)

The CHAIRMAN. Section IV reads as follows:

IV. It is recommended that all cases of poliomyelitis should be reported immediately to the local health authorities and to the State health authorities, and that State health authorities make weekly reports to the United States Public Health Service of all cases of poliomyelitis. The United States Public Health Service is asked to furnish general reports weekly.

(It was moved and seconded that Sec. IV be adopted, and the question being taken, the motion was agreed to.)

The CHAIRMAN. Section V reads as follows:

V. It is recommended that all persons 16 years old or under, with a clean bill of health, and removing from an infected area or district to another locality, should be kept under medical observation daily for two weeks from the date of the certificate.

(It was moved and seconded that Sec. V be adopted, and the question being taken, the motion was agreed to.)

The CHAIRMAN. Section VI is as follows:

VI. It is believed that the period of isolation of a case of poliomyelitis should be not less than six weeks from date of onset.

Dr. SWARTS. I move that it be amended by inserting "four weeks" for "six weeks," just to get an expression from the floor.

Dr. RANKIN. As a compromise, I move to make it five weeks.

Dr. BURKART. I move the adoption of the section as read.

Dr. SWARTS. I move that the word "six" be changed to "four," so that it will read "four weeks," as between the maximum and the minimum. It is made eight weeks in New York.

Dr. GARRISON. I second that motion.

The CHAIRMAN. The motion is now on the reduction of the period of isolation from six weeks to four weeks.

(The question was taken and the motion was not agreed to.)

The CHAIRMAN. The question now is on the adoption of the section as a whole.

(The question was taken and the motion was agreed to.)

The CHAIRMAN. Section VII reads:

VII. The isolation of cases of poliomyelitis should be stringent isolation of the sick person with attendant or attendants, in a properly screened room or rooms, with disinfection, at the bedside, of all bodily excretions. Wherever it is possible, the removal of patients to a hospital is greatly to be preferred to isolation in a private house or apartment.

Dr. BURKART. I move that the section be adopted.

(The motion was seconded.)

Dr. DRAKE. I wish to know whether that section or the following section provides for the other inmates of the premises who continue to reside thereon, the adult members of the family? I think that is a very important part of this consideration.

The CHAIRMAN. Dr. Fulton, will you answer that question?

Dr. FULTON. This section does not provide for the isolation of persons. They are not specified, and therefore it does not apply to them. The committee was not undertaking to do for public health officers what they should do for themselves.

Dr. DRAKE. Then do I understand that if an adult inmate of infected premises applies for a health certificate, that health certificate may be issued to him—I mean an adult actually residing on infected premises?

Dr. FULTON. Why, no; that is very clearly covered. In every case the permit must specify the residence and——

Dr. DRAKE. I mean the adult, you understand, of course.

Dr. FULTON. Yes.

Dr. DRAKE. Then does this contemplate the quarantine of adult members of the family continuing to reside on the premises?

Dr. FULTON. I can not see that this section relates in anywise to any other person than the sick person and attendants. It is a stringent isolation. The only thing that is intended to be covered is the sick person and his attendant.

The CHAIRMAN. The chair will rule that this section relates only to the sick person or his attendant, and the question of quarantine of the other members of the household must be taken up under another section, if you wish to offer another section.

Dr. WOODWARD. Now, are we to understand that that is adopted as a principle, and that it follows that those on the premises under 16 years of age where the patient is located are perfectly safe to run around in the community at large, but are not safe for interstate travel? That is the only inference that I can draw from this section, because there is no restriction suggested, even as to children on the infected premises, except that they must not go into interstate travel.

The CHAIRMAN. Will you take that up under another section?

Dr. WOODWARD. No; but——

The CHAIRMAN. If you wish to consider the question of contact I would suggest that you take up another section regarding contact. This relates to the sick person or attendant.

Dr. WOODWARD. My purpose is to know what the committee means by this section and what its effect will be if adopted, in order that we may be guided in our future actions.

Dr. BRACKEN. If I might say a word, I would suggest that this report of the committee has relation to interstate and intrastate traffic, and not to home quarantine. It would be impossible for our com-

mittee to make regulations governing the isolation in the home of cases of anterior poliomyelitis. Many States have different rules and laws which are applicable. We are dealing now only with interstate and intrastate traffic.

Dr. WOODWARD. If I took Dr. Bracken at his word, I would move to strike this section out. I do not take him at his word, and, if I may be permitted to do so without stultifying myself, I am going to move to amend this section by adding after the word "attendants" the words "and all inmates of the infected household less than 16 years of age," as that seems to be the dead line.

Dr. FULTON. You would accomplish by that exactly the same grade of isolation for them as you do for the sick person.

Dr. WOODWARD. If they are dangerous they ought to be isolated. I will change it and move to insert those words after the word "excretions," then.

The CHAIRMAN. Is there a second to this motion? The chair hears none. The question is now on the section as a whole, Section VII.

Dr. LEAKE. In regard to the hospitalization of these cases, I should like to add a word in connection with what Dr. Albert has said concerning future treatment. You remember that yesterday Dr. Emerson emphasized that in severe cases it was not a necessity that immediate hospitalization be followed. The treatment in the acute stage recommended by those who have had the most experience is absolute rest, and meddlesome interference with the patient should not be permitted. That means that hospitalization should be carried out where it can be without injury to the patient, but that otherwise it should not be followed.

The CHAIRMAN. I think that was made very clear yesterday, and I think furthermore it says here, "is greatly to be preferred."

Dr. LEAKE. Yes.

The CHAIRMAN. So that this is broad enough not to interfere on that.

Dr. LEAKE. Simply, it is a matter of absolute rest that is required.

The CHAIRMAN. The question is on the adoption of Section VII.

(The question was taken and the motion was agreed to.)

The CHAIRMAN. Section VIII is as follows:

VIII. In case of death from poliomyelitis the funeral should be strictly private.

Dr. BURKART. I move that that section be adopted.

(The motion was seconded, and the question being taken the motion was agreed to.)

The CHAIRMAN. Section IX reads as follows:

IX. Wherever poliomyelitis is unusually prevalent, assemblages of children in public places should be prohibited.

(It was moved and seconded that the section be adopted as read, and the question being taken the motion was agreed to.)

The CHAIRMAN. Section X reads as follows:

X. During unusual prevalence of poliomyelitis schools should not be opened without thorough medical supervision by a health authority. When schools are opened, beginning should be made with high schools, and proceeding to lower age groups no more rapidly than complete medical examinations can be made.

(It was moved and seconded that the section be adopted as read, and the question being taken the motion was agreed to.)

The CHAIRMAN. Section XI reads as follows:

XI. Because of the existence of unknown carriers of the infectious virus of poliomyelitis and because the infectious virus is present in the body discharges of such persons, therefore all measures to prevent contamination by human excreta or other bodily discharges, the suppression of the fly nuisance, prohibition of the common drinking cup, and a general educational campaign for cleanliness and sanitation, with particular instruction of parents and children concerning personal hygiene, especially of the mouth and nose, are strongly urged by the committee.

(It was moved and seconded that the section be adopted, and the question being taken the motion was agreed to.)

The CHAIRMAN. Section XII reads as follows:

XII. To aid in preventing the spread of poliomyelitis, common carriers should instruct their agents and ticket sellers, by direct order, as well as by public notices, when poliomyelitis is unusually prevalent, that travelers with children of 16 years or under must be provided with a health certificate, as detailed in another section of this report.

Dr. DOWLING. What are we to understand by "unusually prevalent"? If there were 65 cases in six weeks' time would you say that was unusually prevalent?

Dr. FULTON. Yes; I would say that it was.

Dr. PARLETT. I would suggest to add the following as an amendment, "Common carriers to be notified by the Public Health Service of the area of prevalence and at what points certificates must be displayed before permitting the travel of children of 16 years or under."

The CHAIRMAN. Does the conference wish to do anything with this suggestion which Dr. Parlett has made?

Dr. FULTON. I might say to Dr. Parlett that he has furnished the committee very pertinent information. I do not know whether it can be executed at this time, but undoubtedly all of us will realize that this requirement, if imposed upon us by carriers, would put upon the health authorities the obligation to give them in all cases just exactly such notice as they require. It is obvious that the request is perfectly reasonable, and it would seem to me that the obligation is implied in the stipulations on our part. If you will accept that in lieu of a motion, I think we can let it go.

Dr. WOODWARD. I second Dr. Parlett's motion, or rather I offer the motion Dr. Parlett has suggested. I say we have provided that the Public Health Service shall investigate the infected area, so that the Public Health Service must have the knowledge in hand before it acts.

The CHAIRMAN. Is there a second to Dr. Woodward's motion?

(Dr. Woodward's motion was seconded.)

The CHAIRMAN. Dr. Woodward has moved to amend the last section of this report so that it will read:

Common carriers to be notified by the Public Health Service of the area of prevalence, and at what points certificates must be displayed before permitting the travel of children 16 years of age or under.

This imposes a pretty heavy responsibility on the service.

Dr. WOODWARD. They have got to do it anyway, though.

The CHAIRMAN. Yes.

Dr. WOODWARD. It would be the Public Health Service or the State authorities, as the case may be. If it is interstate service it would be the Public Health Service.

The CHAIRMAN. It will then read: "Common carriers to be notified of the area and prevalence of the infection, and at what points certificates must be displayed before permitting the travel of children of 16 years of age or under." Is there any discussion?

(The question being taken, the motion was agreed to.)

The CHAIRMAN. Section XIII reads as follows:

XIII. The epidemic prevalence of poliomyelitis in certain States at this time indicates a probability of epidemic prevalence next year in States not gravely affected at the present time. It is believed that the measures here recommended should be continued in operation at least until such time as the incidence of the disease has subsided to or below its usual level.

Dr. WOODWARD. Why should not these measures be continued indefinitely, and why should we limit them as to time?

Dr. FULTON. We do not.

The CHAIRMAN. It says "continued in operation at least until such time as the incidence of the disease," etc. That is not a prohibition for continuing it as long as they wish.

Dr. STILES. Would not "possibility" instead of "probability" be a more appropriate word?

Dr. FULTON. It indicates an expectation.

Dr. STILES. Expectation. That would make it like getting ready to prepare to commence.

Dr. FULTON. That is what we are doing.

The CHAIRMAN. I think "possibility" is the better word.

Dr. STILES. Or "likelihood."

Dr. FULTON. That is better yet.

The CHAIRMAN. What word shall we insert here, or shall we insert any?

Dr. SWARTS. I move that the section be adopted as read.

(The motion was seconded, and the question being taken the motion was agreed to.)

The CHAIRMAN. The question is now on the adoption of the report as a whole.

Dr. FULTON. Before any other action is taken, I should like to say a word by way of inquiry of Dr. Dowling about the words "unusual prevalence of poliomyelitis." Throughout this report the committee has rather refrained from getting into difficulties, where distinctions have to be made in matters of epidemic magnitude for which there are no criteria, but for which criteria will probably be made within a year's time. If we say an epidemic prevails, I think that includes every mode of expression; and I think it would be better than to say "unusual prevalence."

Dr. WILLIAMS. The question with the railroad people who have to carry these people is a very important one. It is illegal for the railroad to sell tickets or to refuse to carry anybody unless they present evidence of disease at the time they board the train. Now, it would be illegal at the present time for the railroads to refuse to carry people because they have not certificates.

The CHAIRMAN. I think I can answer this. The railroads come under the existing interstate quarantine regulations. They are common carriers, and if the common carrier does not observe these regulations he lays himself liable. This regulation is as follows:

SEC. 17. Common carriers shall not knowingly accept for transportation from one State or Territory or the District of Columbia into another State or Territory or the District of Columbia any person suffering from any of the diseases mentioned in section 1, except as hereinafter provided.

Poliomyelitis is one of the diseases mentioned in section 1, and there are no hereinafter provided regulations for poliomyelitis. Therefore the railroads are prohibited from carrying cases of poliomyelitis.

SEC. 18. No person knowing that he is in the communicable stage of any of the diseases enumerated in section 1 shall travel on any car, vessel, vehicle, or conveyance engaging in interstate traffic, except as hereinafter provided, nor shall any parent or guardian allow any minor, or other person under his charge who is in the communicable stage of any of such diseases, to travel in any car, vessel, vehicle, or conveyance engaging in interstate traffic.

SEC. 19. No person, firm, or corporation shall offer for shipment in interstate traffic, and no common carrier shall accept for shipment, or transport in interstate traffic, any article or thing known to have been exposed to the contagion or infection of any of the diseases enumerated in section 1, etc.

SEC. 21. Any person or thing, either living or dead, which has been exposed to or is infected with any of the diseases enumerated in section 1, if found in

any car, vessel, vehicle, or conveyance undergoing interstate transportation, shall be subjected to such inspection, disinfection, or other measures as may be necessary to prevent the spread of the infection from them.

It appears to me that the railroads must demand these certificates for their own protection, in order to keep themselves out of trouble.

Dr. GARRISON. It seems to me there is one point that has not been definitely covered, and that is with reference to the transportation of people from uninfected into infected districts. As I came to this conference quite a number of people boarded the train at Buffalo. No inspection certificate was required. Some of them came from the West. In the particular case in question the man and his wife stated they came from Kansas City, where there was no poliomyelitis. An inspector boarded the train, to the surprise of everyone, at a little town 30 miles from Buffalo and demanded a certificate. They did not have it, and 30 or 40 people were put off at a town certainly outside of the area of this infection. The train officials were anxious to know if they were liable in damages if they put these people off.

Dr. PARLETT. It seems to me this is certainly up to the health boards if they undertake to take passengers off trains, and therefore the companies are not liable for any such action.

The CHAIRMAN. The question is now on the adoption of the report as a whole.

Dr. SWARTS. I move the adoption of the report as a whole.

(The motion was seconded.)

Dr. WRIGHT. In regard to the railroads, how is a child worker, a commuter, to take advantage of the monthly commutation rate under that rule?

The CHAIRMAN. I would suggest that you take up that question after the adoption of the report. Are you ready for the question?

(The question was taken, and the report was adopted.)

The CHAIRMAN. The report is accepted, and I congratulate the conference on the very great excellence of the report it has accepted and the committee on the splendid work it has done in this regard.

Dr. SWARTS. Might I ask when we may expect a copy of these rules?

The CHAIRMAN. I think the probabilities are that they can be published immediately. Dr. Trask, do you think it would be possible for us to get this out as a special publication within the next few days?

Dr. TRASK. Yes.

Dr. WILLIAMS. Could not each delegate be provided with one in the next two hours?

The CHAIRMAN. We are making carbon copies, now.

Dr. WILLIAMS. So that if the delegates come back at 2 o'clock they can all get copies?

MISCELLANEOUS BUSINESS.

The CHAIRMAN. The program for the conference is exhausted, with the exception that we desire to give people an opportunity to speak their minds on the poliomyelitis question. The Chair will first listen to Dr. Wright.

Dr. WRIGHT. Can a ticket agent sell a monthly commutation ticket to a child worker—that is, a worker going into New York daily—under 16 years of age? There are thousands of office boys who work in New York during the summer and buy commutation tickets from New Jersey and Connecticut.

The CHAIRMAN. Dr. Banks, will you please answer that question?

Dr. BANKS. I did not quite understand it.

The CHAIRMAN. The question was, Can a railroad company sell a commutation ticket to a child under 16 years of age?

Dr. BANKS. I know no reason why not.

The CHAIRMAN. Upon the presentation of a health certificate?

Dr. BANKS. Yes.

Dr. FULTON. I understood Dr. Banks to say a few minutes ago that the conditions at that point were dealt with by certificates of health being renewed every 7 days.

Dr. COLLINS. Mr. Chairman, I now want to insist on Dr. Porter's motion of yesterday, that a common report, containing the consensus of opinion of this conference, be given us for the benefit of our people at home. Dr. Porter, you made that motion yesterday?

Dr. PORTER. I withdrew it.

The CHAIRMAN. You will all receive reports of this meeting. They will be published.

Dr. PORTER. I think we all know what the consensus of opinion is.

Dr. ROBERG. Coming back to the report blank on infantile paralysis, I would like to make a motion that a supplemental slip be attached to each report blank, giving the differential diagnosis between infantile paralysis and those diseases which may simulate it, together with other salient points deemed necessary by the Public Health Service.

Dr. WOODWARD. I second that motion.

The CHAIRMAN. It has been moved and seconded that there be attached to the report blank a statement of the salient points of the differential diagnosis of infantile paralysis. Is there any discussion?

(The question was taken and the motion was agreed to.)

The CHAIRMAN. Is there any other person who has anything he would like to say to the conference?

Dr. PARLETT. I think it would be of advantage if the Public Health Service would arrange to have a subsequent meeting with represent-

atives of the railroads, to clear up several points under discussion, with particular reference to regulation No. 22.

The CHAIRMAN. Is there any other business to come before the conference?

Dr. WOODWARD. Mr. Chairman, do I understand that this request which has just been made is for a conference of certain railroad representatives with this body?

Dr. PARLETT. Of railroad representatives with the Public Health Service.

Dr. WOODWARD. Oh, with the Public Health Service?

The CHAIRMAN. That will have to be arranged for later.

Dr. DRAKE. I think probably one of the most important things that this conference can do now is to appoint a committee for the purpose of formulating rules for the control of poliomyelitis——

The CHAIRMAN. In the home?

Dr. DRAKE. In the home, and to offer them to the various States for adoption, as a model. I make a motion to the effect that such a committee be appointed.

(The motion was seconded.)

The CHAIRMAN. You have heard the motion, that a committee be appointed for the purpose of formulating rules and regulations for the control of poliomyelitis in the home. Is there any discussion?

(The question was taken and the motion was agreed to.)

COMMITTEE APPOINTMENTS.

The CHAIRMAN. The chair will appoint as members of this committee Dr. Drake, Dr. Roberg, Dr. Garrison, Dr. Tuttle, and Dr. Collins.

Dr. BRACKEN. When will that committee report?

The CHAIRMAN. That committee will report at 2 o'clock this afternoon. The chairman will appoint as a standing committee on poliomyelitis Dr. Lavinder, Dr. Tuttle, Dr. Drake, Dr. Dowling, and Dr. Frost.

The chair will now entertain a motion to adjourn until 2 o'clock.

(At 12.40 o'clock p. m. the conference took a recess until 2 o'clock p. m.)

AFTERNOON SESSION, SECOND DAY.

(The conference was called to order at 2 o'clock p. m. by the acting chairman, Asst. Surg. Gen. W. C. Rucker.)

The CHAIRMAN. The first business to be taken up by the conference this afternoon is the receipt of the report of the committee on the prevention of the spread of poliomyelitis in the home. Dr. Drake, the chairman of the committee, is ready to make his report.

REPORT OF THE COMMITTEE ON THE PREVENTION OF THE SPREAD OF POLIOMYELITIS IN THE HOME.

Dr. DRAKE. Mr. Chairman, we have had a very short time in which to give consideration to this important question, but we have formulated what we think are the essential rules for the control of poliomyelitis. These rules are framed with full knowledge of the fact that we have very little definite scientific information of the disease. Under the circumstances we have endeavored to adopt rules which will safeguard against all avenues of infection [reading]:

1. *Reports.*—Every physician, attendant, parent, householder, or other person having knowledge of a known or suspected case of acute anterior poliomyelitis must immediately report the same to the local health authorities.

2. *Placarding.*—Whenever a case of acute anterior poliomyelitis is reported to the local health authorities, they shall affix in a conspicuous place at each outside entrance of the building, house, or flat, as the case may be, a warning card.

We do not go into detail as to the size of the card or the text.

Defacement of such placards or their removal by any other than the local health authorities or the duly authorized representative of the State board of health is strictly prohibited.

3. *Quarantine of patient.*—All cases of acute poliomyelitis must be quarantined for at least six weeks. Quarantine must not be raised, however, until the premises have been thoroughly disinfected by or under the supervision of the health officer. All persons continuing to reside on the infected premises shall be confined to the infected building, house, or apartment until quarantine has been raised, except as hereinafter provided.

No one but the necessary attendant, the physician, the health officer, and representatives of the State board of health may be permitted to enter or leave the infected premises. Upon leaving they must take all precautions necessary to prevent the spread of the disease. The nursing attendant may leave the premises only on permission granted by the local health officer.

4. *Quarantine of exposures.*—Adult members of the family may be removed from the infected premises upon permission granted by the local health officer after thorough disinfection of person and clothing.

Children of the family may be removed from the infected premises upon permission of the local health officer, after thorough disinfection of person and clothing. Such children may be removed only to premises upon which none but adults reside, and must be confined to the premises (in the house) for two weeks from date of removal, during which period they must be kept under close observation by the local health authorities, and no child shall be permitted to visit or otherwise come in contact with them during this period. They must not return to the infected premises or come in contact in any way with the patient or attendant until quarantine has been terminated.

All children who continue to reside on the infected premises must be held under close observation for at least two weeks following termination of the last case on the premises.

5. *Exclusion from the schools, etc.*—All children who continue to reside on the infected premises must be excluded from the schools and other public gatherings for at least two weeks following date of raising of quarantine.

All children who have been exposed to the disease and who have been removed from the infected premises, in accordance with the provisions of rule 4, must be excluded from the schools and from all public gatherings for at least two weeks from date of last exposure.

The patient must be excluded from the schools and all public gatherings for at least two weeks after quarantine is raised.

School teachers and other persons employed in or about a school building, who have been exposed to the disease, must be excluded from the school building and grounds for a period of two weeks following date of last exposure and until persons and clothing have been thoroughly disinfected.

Whenever the schools are closed on account of an outbreak of acute poliomyelitis, children under 16 years of age shall be excluded from Sunday schools, churches, picture shows, and all other public gatherings, and shall be confined to their own premises.

That relates only to instances where the schools are closed. Otherwise, of course, the children would be permitted to roam the streets at large.

6. *Precautions.*—No person, except the necessary attendant, the physician, and the health officer may be permitted to come into contact with the patient. Such persons must not handle or prepare food for others, and their intercourse with other members of their household must be as restricted as possible.

The infected premises, especially the sick room, shall be thoroughly screened against flies, and any such insects as may enter the sick room shall be therein exterminated.

We say "therein exterminated" in preference to driving the flies out of the premises into the open air.

All toilets used by the patient or attendants and those in which discharges from the patient are deposited must be thoroughly screened against flies and freely treated with an approved disinfectant.

7. *Removals.*—No person affected with acute anterior poliomyelitis shall be removed from the premises upon which he is found unless consent to such removal be first obtained from the local health authorities or the State board of health, and then only after strict compliance with the provisions of these rules. Under no circumstances shall permission be granted for the removal of any patient or article from the infected premises to any premises upon which milk or other foodstuffs are produced, sold, or handled.

No person affected with acute anterior poliomyelitis shall be removed from any city, village, township, or county in which he is found unless consent to such removal be first obtained from the State board of health.

8. *Sale of milk and other foodstuffs from infected premises prohibited.*—Whenever a case of acute anterior poliomyelitis shall occur on any premises where milk or other foodstuffs are either produced, handled, or sold, the sale, exchange, or distribution on such premises in any manner whatsoever, or the removal from the infected premises of milk, cream, any milk products or other foodstuffs, until the case has been terminated by removal, recovery, or death, and the premises and contents and all utensils have been thoroughly disinfected under the supervision of the local health authorities, is prohibited: *Provided*, That in the event of acute anterior poliomyelitis occurring on a dairy farm, the live stock only may be removed to some other premises and milking done and milk cared for and sold from such other premises by persons

other than those of the household of the person so affected, upon obtaining permission to do so from the local health authorities or the State board of health.

Whenever a case of acute anterior poliomyelitis shall occur on premises connected with any store, such store shall be quarantined until the case has been terminated by removal, recovery, or death, and the premises are thoroughly disinfected: *Provided, however*, That if the premises are so constructed that the part in which the case exists can be and is effectively sealed, under the supervision of the local health authorities, from the store: *And provided further*, That the employees and all other persons connected with the store do not enter the part of the premises where the case exists and do not come in contact with the patient, his attendant, or any article whatsoever from the quarantined premises, the store attached to the quarantined premises need not be closed.

9. *Delivering of milk, groceries, and other necessities.*—Milk, foodstuffs, and other necessities may be delivered at the quarantined premises, but there must be no contact between the patient or attendant and the delivery agent. Whenever practicable, milk must be delivered in bottles. When milk can not be delivered in bottles, the householder must provide a sterilized container (a freshly scalded bottle or pail) to receive the milk.

No milk bottle, basket, or any other article whatsoever may be taken out of or away from the infected premises during the period of quarantine. Before milk bottles are removed from the premises after quarantine is raised they must be sterilized under the direction of the local health authorities. Mail which has been handled by the patient or attendant must not be taken from the premises.

10. *Disinfection.*—All articles taken from the sick room must be disinfected upon removal. Exposure in the open air of carpets, rugs, curtains, bedding, and similar articles from the infected premises, for the purpose of airing, shaking, beating, or sunning, is strictly prohibited, unless, in the opinion of the local health authorities, such may be done without danger of the spread of the disease.

Books, toys, and similar articles used to amuse the patients are best disposed of by burning. Under no circumstances should borrowed toys or books be returned. Library and school books must not be returned; they must be burned.

Bed and body linen which has been in contact with the patient, and handkerchiefs or cloths which have been used to receive discharges from the patient must be immersed in an approved disinfectant before removal from the sick room, and after removal should be boiled.

All discharges from the patient must be thoroughly disinfected before removal from the sick room.

No article of clothing, or other article, may be removed from the infected premises to a laundry or other place for washing unless previously disinfected by immersion in an approved disinfectant, and the approval of the local health authorities has been obtained.

House animals such as cats, dogs, or any other household pets, and all other animals or fowls, must be strictly excluded from the infected building, house, or flat, as the case may be, during the entire period of quarantine. Any such animals which have been in contact with the patient must be subjected to a thorough disinfecting bath before removal from the infected building, house, or flat, and must not be permitted to reenter the same. Such animals must be confined in an outbuilding. Dogs and cats running at large should be destroyed.

Before quarantine is raised the infected premises and all articles of furniture and clothing therein must be thoroughly disinfected by or under the supervision

of the local health authorities in a manner approved by the State board of health.

11. *Deaths, burials, and transportation of the dead.*—When the body of anyone dead from acute anterior poliomyelitis is to be transported by railroad or other common carrier the official rules of the State board of health governing the transportation of the dead must be observed.

The report is signed by C. W. Garrison, W. B. Collins, T. D. Tuttle, D. N. Roberg, and C. St. Clair Drake.

The CHAIRMAN. The conference has heard this report. What shall we do with it?

Dr. SWARTS. I move that it be received.

(The motion was seconded.)

The CHAIRMAN. It is moved and seconded that the report be received. Is there any discussion?

(The question was taken and the motion was agreed to.)

The CHAIRMAN. The question now rises on the adoption of this report. Is there a motion to that effect?

Dr. SWARTS. I move its adoption seriatim by sections.

(The motion was seconded.)

The CHAIRMAN. It is moved and seconded that the report be adopted section by section. Is there any discussion? There seems to be none, and the chairman of the committee will please read the first section.

Dr. DRAKE. The first section reads:

1. *Reports.*—Every physician, attendant, parent, householder, or other person having knowledge of a known or suspected case of acute anterior poliomyelitis must immediately report the same to the local health authorities.

Dr. RANKIN. Would it not be better to insert after the word "poliomyelitis" the words "or infantile paralysis"? There are country people who never heard of poliomyelitis.

The CHAIRMAN. Put in parentheses (infantile paralysis). Without objection, this section as amended will be adopted.

(There was no objection.)

Dr. DRAKE. Section 2 is as follows:

2. *Placarding.*—Whenever a case of acute anterior poliomyelitis is reported to the local health authorities they shall affix in a conspicuous place at each outside entrance of the building, house, or flat, as the case may be, a warning card. Defacement of such placards or their removal by any other than the local health authorities or the duly authorized representative of the State board of health is strictly prohibited.

The CHAIRMAN. I would like to ask the chairman whether his committee considered the placarding of streets. In New York where a considerable number of cases existed a large placard, reading "Poliomyelitis exists in this street," was placed at each end of the street. It seems to me a logical measure in places which are thickly inhabited.

Dr. Collins. Our function, as we understood it, was merely to provide for the prevention of the spread of poliomyelitis in the home.

The Chairman. Yes.

Dr. Collins. We confined our deliberations more particularly to the home and not to the district.

The Chairman. This committee was to consider the control for the homes and not districts.

Dr. Drake. That is a matter for a special ruling.

(It was moved and seconded that section 2 be adopted as read, and, the question being taken, the motion was agreed to.)

Dr. Drake. Section 3 is as follows:

3. *Quarantine of patient.*—All cases of acute poliomyelitis must be quarantined for at least six weeks. Quarantine must not be raised, however, until the premises have been thoroughly disinfected by or under the supervision of the health officer. All persons continuing to reside on the infected premises shall be confined to the infected building, house, or apartment until quarantine has been raised, except as hereinafter provided.

No one but the necessary attendant, the physician, the health officer, and representatives of the State board of health may be permitted to enter or leave the infected premises. Upon leaving they must take all precautions necessary to prevent the spread of the disease. The nursing attendant may leave the premises only on permission granted by the local health officer.

The Chairman. What is your pleasure as to this section? Without objection, the section will stand adopted.

Dr. Burkart. One moment.

The Chairman. There is objection.

Dr. Burkart. The objection is this: You have restricted all individuals absolutely to the house by the wording of that rule. If you say "premises" it is different. In many places some people have back yards. You say definitely "building, house, or apartment." If you say "premises" and permit persons to go in the yard, but not to mingle with others, that is different. That question comes up very frequently—whether individuals shall be confined directly to the house or have the privilege of roaming over their own premises so long as they come in contact with no visitor. Under the wording as you have it there they must remain in the building.

Dr. Drake. It reads, "shall be confined to the infected building, house, or apartment until quarantine has been raised." In a thickly populated community that is necessary. In a rural district it is different.

Dr. Bracken. I am afraid that is going to make more trouble. You have a regulation there that is extremely rigid, and I am inclined to believe that it will not be accepted. Now, what position is it going to put us in if we advise the continuance of the present regulation? We at present allow a certain amount of liberty to adults living in the house. We would allow a farmer to go on about his business, although he was living right in the house. We would

allow him even to go to town to sell his grain, but under this regulation he could not go off the premises. That is like a smallpox quarantine of 20 years ago, when we established a shotgun quarantine and absolutely stopped all traffic or communication with those who had smallpox in their house. I do not care to go back to that.

Dr. DRAKE. Of course we know little about the mode of infection of this disease. It has been pretty generally acknowledged by those who have spoken in this conference that the adult carrier is a big factor in the dissemination of the infection. If the adult carrier is a big factor in the dissemination of the infection, then the adult carrier should certainly be confined to the premises.

Dr. BURKART. The word "premises" is different from "house."

Dr. ANDREWS. If the adult carrier is to be confined to the premises, why should that adult carrier be permitted to get on a railroad train and go where he chooses?

The CHAIRMAN. I think the answer to that is that when a man is on premises where there is a known case of poliomyelitis, he occupies a very different situation than when he is going about at large. Then we have nothing by which to judge that he is a carrier. We do not know at the railroad station whether he is a carrier or not.

Dr. ANDREWS. Do you not think that it is the duty of the health officer, in the protection of the public, to ask him whether he has come from a place where there is poliomyelitis or not?

The CHAIRMAN. Yes; and that is the method of protecting the public.

Dr. ANDREWS. If he says that he has, you do not give him a certificate.

The CHAIRMAN. If he is held in the place of quarantine he can not apply for a certificate to travel.

Dr. WOODWARD. If you hold the children on the place they can not apply, either, can they?

The CHAIRMAN. The children do not all come from infected places, but this man we are supposing has come from an infected place.

Dr. ANDREWS. Suppose this man did not know the place was infected, or that he came out voluntarily from an infected place, and suppose he did know it, and the health authorities did not question him?

The CHAIRMAN. You can not stop that.

Dr. ANDREWS. But we stopped it with the children 10 years of age.

Dr. WOODWARD. I would suggest that you solve it by asking no questions about the children, and that will protect the children.

Dr. ANDREWS. Even so.

Dr. DRAKE. I think we are going beyond Dr. Burkart's suggestion by making it read that all persons continuing to reside on the

infected premises shall be confined thereto. That would leave it so they might be confined to the yard of the house.

Dr. COLLINS. Or to the farm.

Dr. DRAKE. With the permission of the committee we will make that change.

Dr. ANDREWS. If the man, then, is to be kept out of his home, I will be frank with you and state that there is not one person in the State of Alabama who will obey the regulation. You will have to have a shotgun to enforce it.

Dr. DOWLING. We have had but two instances where two cases of poliomyelitis have occurred in the same home. With a history of that kind before us, it is going to be awfully hard to enforce a quarantine. I am not going to oppose anything that can be done, but it will be very difficult to enforce a regulation of that kind.

Dr. WOODWARD. As a simple matter of fact, we acted on this matter this morning in a diametrically opposite way. I offered an amendment this morning that provided for a quarantine on the premises only of children under 16. That was adopted. Now we are reversing our action by proposing to quarantine everyone.

Dr. ANDREWS. It occurs to me that we are up against a proposition we do not know anything about, and we might just as well take the public into our confidence and inform them of that fact. From the statements made here yesterday—and they were full, free, frank, and illuminating—gentlemen of experience confessed that all their efforts toward prevention had apparently done nothing to curb this malady. Now we can not claim that these efforts have not to some extent, at least, accomplished good, for the reply might be, "Suppose that nothing had been done; we do not know what might have happened." That is all true. The disease presumably is due to a virus from the emanations of the sick, but just how it is conveyed from the sick to the well nobody knows. By our action this morning we have said that it is conveyed by children under 16 years of age, but a child 16 years and 1 day old does not tote it around with him. Now that has been said so many times it does not go any longer with the public, because they do not believe it, and it seems to me we are traveling dangerously near to ground where angels would fear to tread. I am perfectly willing to go on record as in favor of everything that will be of help in the protection of the public. That is what we are here for. It seems to me utterly absurd to put a dead line on those who are in the home and absolutely raise the dead line against the traveling public. If we are going to say that every person over 16 years of age can go where he pleases on a train we ought to say that he can do the same thing at home.

The CHAIRMAN. The chairman's opinion in this matter is that we can not afford to leave any stone unturned until the time shall come

when someone will come to us and give us definite, accurate knowledge of this disease so that we may with equal accuracy and definiteness combat it.

Dr. ANDREWS. I agree thoroughly with the chairman; but can the chair say that an adult does not have the disease any more than a child 16 years of age?

The CHAIRMAN. No; the chair does not.

Dr. ANDREWS. Then why draw the line? I merely ask, if we have no definite knowledge as to who the carrier is, why do we specify? Now, then, do you not think it would be much better to say, so far as the traveler and the people in the home are concerned, that poliomyelitis is a disease concerning which the medical profession knows practically nothing; that we are groping in the dark and are doing all we can to ascertain what is its cause and how it is disseminated; that until such time as we have more definite knowledge we recommend that the patient and all necessary attendants be strictly isolated; that all persons who have been exposed shall be kept in quarantine for a reasonable length of time—three or four weeks, or whatever it may be—after which they shall be permitted to go where they please, whether they are 16 or 160 years of age?

Dr. BURKART. Mr. Chairman, I did not expect to stir up so much commotion, but I think every gentleman here who understands the situation will agree that in rural districts confining exposed individuals to the house will work great hardship. "Premises" is entirely different. A man's premises may comprise a 40-acre farm. There is no reason why a farmer who is absolutely well should not be permitted to plow his garden or field, so long as the restrictions placed upon him as to mingling with other individuals are observed. If you confine me to my house, I must stay there; but if you confine me to my premises or my domain, that is an entirely different matter.

The CHAIRMAN. What is the pleasure of the conference regarding this subject?

Dr. DRAKE. I would say that, acting upon Dr. Burkart's suggestion, that section would read this way: "All persons continuing to reside on the infected premises shall be confined to the premises."

Dr. BURKART. The immediate premises.

Dr. DRAKE. It would read that way instead of reading as it now does, " confined to the building, house, or apartment."

Dr. ANDREWS. That is, until dismissed?

Dr. DRAKE. Yes; until dismissed.

Now, this next section relates to the release of the adult members.

Dr. DOWLING. Take a large sugar plantation, for instance; a man could roam from house to house on that plantation and still be on the premises.

Dr. Drake. If we were called upon to construe that as applying to the community, small town, or the city, I would say that "premises" mean the home, and it is necessary that persons should be confined to the home for the safety of a community. On the farm they might be confined to the farm. On a plantation upon which many people live, a very large farm, you might say if a person were allowed to roam at large over the entire area that the object of the regulation of the health authorities would be defeated. The word "premises" is questionable.

Dr. Banks. I should like to say a word in relation to the attitude of the general traveling public to the regulations we have established in New York. I have found very little complaint, and there has been a more or less general acquiescence in the reasonableness of the regulations. A great many people have expressed gratification that these regulations have been established and enforced, and I think the public generally has complied with them to the fullest possible extent. They are satisfied that something is being done. I do not know that they are satisfied that everything is being done, or that the right thing is being done, but they are satisfied that we are doing something to protect them, whether it is scientifically correct or not.

Just one thought in relation to the word "premises." In New York City the situation is somewhat complicated by the fact that there are a very large number of tenement houses, and it is pretty difficult to say what a "premise" is in a tenement house or in a hotel. I think in New York City they have held that if the patient is removed from a hotel and the room disinfected, the hotel is clean.

Dr. Andrews. As long as the patient remains in the hotel it is regarded as infected premises.

Dr. Banks. As long as the patient remains in the room, and it is not disinfected.

Dr. Porter. Is the entire hotel considered to be infected premises, or just the room that the patient occupies?

Dr. Banks. Until the patient is removed from the hotel and the room is renovated, or whatever process they go through.

Dr. Porter. Supposing it is a disease which makes it dangerous to remove the patient to a hospital; would you quarantine the entire hotel?

Dr. Banks. I know that they remove all cases as soon as possible, and after the process of renovation of the room the hotel is declared free from infection.

The Chairman. The question is on the adoption of this section.

(The question was taken and the section was adopted.)

Dr. DRAKE. Section 4 reads:

4. *Quarantine of exposures.*—Adult members of the household over 16 years of age may be removed from the infected premises upon permission granted by the local health officer, after thorough disinfection of persons and clothing.

Dr. DOWLING. What do you consider disinfection?

Dr. DRAKE. That is for the local health authorities to determine.

Dr. DOWLING. I wanted to know whether you meant disinfection with formaldehyde.

Dr. WOODWARD. Had we not better make that "members of the household over 16 years of age," instead of as it is, "adult members of the household"?

Dr. DRAKE. Pardon me, Doctor; it covers children. That is part of the same section. The rest of the section reads:

Children of the family may be removed from the infected premises upon permission of the local health officer, after thorough disinfection of person and clothing. Such children may be removed only to premises upon which none but adults reside and must be confined to the premises (in the house) for two weeks from date of removal, during which period they must be kept under close observation of the local health authorities, and no child shall be permitted to visit or otherwise come in contact with them during this period. They must not return to the infected premises or come in contact in any way with the patient or attendant, until quarantine has been terminated.

All children who continue to reside on the infected premises must be held under close observation for at least two weeks following termination of the last case on the premises.

Dr. ROBERG. I would amend that to read "disinfection of the clothing and a cleansing bath of the person's body."

Dr. BURKART. It reads "disinfection of person and clothing."

Dr. ROBERG. Aseptic surgery has proved that you can not disinfect the person. I do not see how you can disinfect the body.

Dr. WOODWARD. Notwithstanding the elaboration of the regulations, we draw in these regulations a distinction merely between adults and children. We have made in our other regulations a distinction between persons over and persons under 16 years of age. I think we had better draw the same distinction here.

Dr. COLLINS. We are dealing with the proposition as though those over 16 were adults.

Dr. DRAKE. May I offer the suggestion that that is merely establishing 16 years of age as the dividing line between child life and adult life?

Dr. WOODWARD. Why should we say here with respect to this distinction that we are going to apply one set of rules to those over 21 and another to those under 21, whereas everywhere else we have said we will apply one set of rules to those over 16 and another set of rules to those under 16? Why is that?

Dr. Drake. I think I get your point, and the reason the regulation is drawn in this particular way is this: We will admit, for the sake of avoiding argument, that the adult and the child are equally likely to be carriers of the disease; but children under 16 years of age certainly are much more susceptible to the development of the infection than are persons over 16 years of age, and the reason children are confined is because of their susceptibility to the disease.

Dr. Woodward. I am afraid I am particularly obtuse. There is a period between 16 years of age and 21 years of age that has in all of our other regulations been thrown into the upper age period. In these particular regulations we are throwing it into the lower age period. What is the reason for the difference?.

Dr. Fulton. What is the objection to the inconsistency?

Dr. Woodward. It is not only inconsistency but confusion. We might just as well go through these requirements and make one regulation 16, another 17, another 13, and so on. On the basis of what other communities have done we have fixed 16 as the determining line. Now, why should we depart from that in this case?

Dr. Fulton. Why should we conform to it? In what sense is that an established practice? Where does the necessity for any statement of any sort as to age arise? Consistency in that situation would be immaterial, and I can not see any reason myself for making any alteration for the sake of consistency.

Dr. Williams. I move that instead of using the words "adult members of the family" it be made to read, "members of the family over 16 years of age." That covers the objection.

Dr. Woodward. Absolutely.

Dr. Rankin. And that the change be made wherever those words occur.

The Chairman. The motion is that it be made to read, "members of the family over 16 years of age." You have heard the motion.

(The question was taken and the motion was agreed to.)

The Chairman. The question is now on the adoption of the section.

(The question was taken and the section was adopted.)

Dr. Drake. Section 5 reads as follows:

5. *Exclusion from the schools, etc.*—All children who continue to reside on the infected premises must be excluded from the schools and other public gatherings for at least two weeks following date of raising of quarantine.

All children who have been exposed to the disease and who have been removed from the infected premises, in accordance with the provisions of rule 4, must be excluded from the schools and from all public gatherings for at least two weeks from date of last exposure.

The patient must be excluded from the schools and all public gatherings for at least two weeks after quarantine is raised.

School-teachers and other persons employed in or about a school building who have been exposed to the disease must be excluded from the school building

and grounds for a period of two weeks following date of last exposure and until persons and clothing have been thoroughly disinfected.

Whenever the schools are closed on account of an outbreak of acute poliomyelitis, children under 16 years of age shall be excluded from Sunday schools, churches, picture shows and all other public gatherings and shall be confined to their own premises.

The CHAIRMAN. Without objection, this section will be adopted as read.

(There was no objection and the section was adopted.)

Dr. DRAKE. The next section reads:

6. *Precautions.*—No person, except the necessary attendant, the physician, and the health officer, may be permitted to come into contact with the patient. Such persons must not handle or prepare food for others and their intercourse with other members of their household must be as restricted as possible.

The infected premises, especially the sick room, shall be thoroughly screened against flies and any such insects as may enter the sick room shall be exterminated therein. All toilets used by the patient or attendants and those in which discharges from the patient are deposited must be thoroughly screened against flies and freely treated with an approved disinfectant.

The CHAIRMAN. Without objection this section will be adopted as read.

(There was no objection.)

Dr. DRAKE. The next section reads:

7. *Removals.*—No person affected with acute anterior poliomyelitis shall be removed from the premises upon which he is found unless consent to such removal be first obtained from the local health authorities or the State board of health, and then only after strict compliance with the provisions of these rules. Under no circumstances shall permission be granted for the removal of any patient or article from the infected premises to any premises upon which milk or other foodstuffs are produced, sold, or handled.

No person affected with acute anterior poliomyelitis shall be removed from any city, village, township, or county in which he is found unless consent to such removal be first obtained from the State board of health.

The CHAIRMAN. Without objection this section will be adopted as read.

(There was no objection.)

Dr. DRAKE. The next section reads:

8. *Sale of milk and other foodstuffs from infected premises prohibited.*—Whenever a case of acute anterior poliomyelitis shall occur on any premises where milk or other foodstuffs are either produced, handled, or sold, the sale, exchange, or distribution on such premises in any manner whatsoever, or the removal from the infected premises of milk, cream, any milk products, or other foodstuffs until the case has been terminated by removal, recovery, or death, and the premises and contents and all utensils have been thoroughly disinfected under the supervision of the local health authorities, is prohibited. *Provided*, That in the event of acute anterior poliomyelitis occurring on a dairy farm the live stock only may be removed to some other premises and the milking done and milk cared for and sold from such other premises by persons

other than those of the household of the person so affected, upon obtaining permission to do so from the local health authorities or the State board of health.

Whenever a case of acute anterior poliomyelitis shall occur on premises connected with any store, such store shall be quarantined until the case has been terminated by removal, recovery, or death, and the premises are thoroughly disinfected: *Provided, however*, That if the premises are so constructed that the part in which the case exists can be and is effectively sealed, under the supervision of the local health authorities, from the store: *And provided further*, That the employees and all other persons connected with the store do not enter the part of the premises where the case exists and do not come in contact with the patient, his attendant, or any article whatsoever from the quarantined premises, the store attached to the quarantined premises need not be closed.

Dr. Woodward. With respect to the matter of dairy farms, I would remark that the removal of the cattle does not ordinarily answer the requirements of the situation. We have had occasion to deal with somewhat similar conditions with regard to typhoid fever and scarlet fever outbreaks, and we have directed a disinfection of the utensils, bottles, and cans, so that the business might go on in the name of the owner of the original farm. It seems to me we ought to provide for that. Otherwise the regulation is really not accomplishing its purpose in the case of the retail dealer.

Dr. Drake. I think that could be done under the supervision of the local health authorities.

Dr. Woodward. Yes; and the same as to carts.

Dr. Drake. That is not incorporated here.

Dr. Woodward. I move that it be incorporated by the proper phraseology.

The Chairman. Without objection, this section will be adopted as amended by Dr. Woodward.

(There was no objection.)

Dr. Drake. Section 9 reads as follows:

9. *Delivering of milk, groceries, and other necessities.*—Milk, foodstuffs, and other necessities may be delivered at the quarantined premises, but there must be no contact between the patient or attendant and the delivery agent. Whenever practicable milk must be delivered in bottles. When milk can not be delivered in bottles the householder must provide a sterilized container (a freshly scalded bottle or pail) to receive the milk.

No milk bottle, basket, or any other article whatsoever may be taken out of or away from the infected premises during the period of quarantine. Before milk bottles are removed from the premises after quarantine is raised they must be sterilized under the direction of the local health authorities. Mail which has been handled by the patient or attendant must not be taken from the premises.

Dr. Woodward. There, again, are required to be done exactly the things that we forbid. Instead of ordering the milkman to send his bottles into the infected premises, we order him to keep them out.

Dr. Drake. I do not think I got that.

Dr. Woodward. You say that the milk must be sent into the infected premises in bottles.

Dr. DRAKE. Not necessarily.

Dr. WOODWARD. In all cases where it is possible.

Dr. DRAKE. Yes.

Dr. WOODWARD. We say that in no case shall it be done. We think it is safer to keep them out of the premises than to send them into the premises where they may be used, even by the patient—that is, notwithstanding the fact that after six weeks' accumulation of bottles they may be disinfected.

Dr. ROBERG. Does the doctor refer to the fact that they feed babies on canned milk?

Dr. YOUNG. The regulations of the State of Maine provide that the bottles shall not be carried into the sick room or home.

Dr. DRAKE. The only object in the world in providing for the milk to be delivered in bottles is to prevent the deliverer handling the bottles which have been sent out, thus infecting his hands and the balance of the milk supply.

Dr. COLLINS. In our institutions for tuberculosis we have milk delivered in bottles.

Dr. DRAKE. Of course you understand that all these bottles are to be disinfected under the direction of the health authorities before they can be removed from the premises.

Dr. WOODWARD. In the case of modified milk we would permit bottles to go in under special regulations, but I would not adopt that regulation.

Dr. DRAKE. You think it is safer the other way?

Dr. WOODWARD. Yes. Under the direction of the health officer, I would permit them to go in.

Dr. DRAKE. I have no objection to that, at all.

The CHAIRMAN. What is the pleasure of the conference? The question is whether the milk bottles shall go into the infected home.

Dr. WOODWARD. I move that they be not permitted to go in, except with a special permit from the health officer.

Dr. RANKIN. I second that motion.

The CHAIRMAN. The motion is that milk bottles be not permitted to enter the house unless under special permit of the health officer.

(The question was taken and the motion was agreed to.)

The CHAIRMAN. Without further objection, the section is adopted as amended.

Dr. DRAKE. The next section is:

10. *Disinfection.*—All articles taken from the sickroom must be disinfected upon removal. Exposure in the open air of carpets, rugs, curtains, bedding, and similar articles from the infected premises for the purpose of airing, shaking, beating, or sunning is strictly prohibited, unless, in the opinion of the local health authorities, such may be done without danger of the spread of the disease.

Books, toys, and other similar articles used to amuse the patients are best disposed of by burning. Under no circumstances should borrowed toys or books be returned; they must be burned.

Bed and body linen which has been in contact with the patient, and handkerchiefs or cloths which have been used to receive discharges from the patient must be immersed in an approved disinfectant before removal from the sick room, and after removal should be boiled.

All discharges from the patient must be thoroughly disinfected before removal from the sick room.

No article of clothing or other article may be removed from the infected premises to a laundry or other place for washing unless previously disinfected by immersion in an approved disinfectant, and the approval of the local health authorities has been obtained.

House animals, such as cats, dogs, or any other household pets, and all other animals or fowls, must be strictly excluded from the infected building, house, or flat, as the case may be, during the entire period of quarantine. Any such animals which have been in contact with the patient must be subjected to a thorough disinfecting bath before removal from the infected building, house, or flat, and must not be permitted to reenter the same. Such animals must be confined in an outbuilding. Dogs and cats running at large should be destroyed.

Before quarantine is raised the infected premises and all articles of furniture and clothing therein must be thoroughly disinfected by or under the supervision of the local health authorities in a manner approved by the State board of health.

The CHAIRMAN. Without objection, this section will be considered as adopted.

Dr. WILLIAMS. Mr. Chairman, we recently had a case of poliomyelitis develop on a farm in our State. The week before the child was taken sick it was noticed that several of the chickens were paralyzed, had staggers, and would fall over. This little patient played with one of the chickens that was apparently paralyzed, and a few days afterwards developed infantile paralysis. It has been noticed that chickens on such premises frequently have paralysis, and if we apply this regulation to dogs and cats, it is a question whether we should not take fowls into consideration. I simply mention it. I do not think it is practical, though, to kill the chickens which it might be believed were infected.

The CHAIRMAN. I think the suggestion of Dr. Williams is a very good one, and without objection this section, with Dr. Williams' amendment, will be considered as adopted.

(There was no objection.)

The CHAIRMAN. The question is now on the adoption of the report as a whole.

Dr. WOODWARD. There is a feature of prevention adopted in New York City, and possibly in Newark, and that is, forbidding the return of goods to the sending concerns—goods which have been sent on approval to recently infected premises. That may be covered.

Dr. DRAKE. Nothing can be removed from the infected premises during the period of quarantine and until after the raising of the quarantine.

The CHAIRMAN. The question is on the adoption of the report as a whole.

(The question was taken, and the report was adopted.)

The CHAIRMAN. The report of the committee is adopted, and the chairman would request that Dr. Drake dictate the report to a stenographer before he leaves the building, so that we may have an accurate record of it.

Dr. Levy, of Richmond, is with us, and desires to make a short statement regarding some observations which he has made on this disease. Dr. Levy is a very welcome guest at this conference, and the Chair takes pleasure in presenting him to you.

Dr. LEVY. Mr. Chairman and gentlemen, like the rest of you, I am mystified and puzzled by this grave disease. Certain things have suggested themselves that it seems to me have not been brought out, and at the same time are apparently of unquestioned importance, and worth following out.

In investigating an epidemic of measles, for example, it would be perfectly useless for us to start in with two or three thousand cases and attempt to find out anything about it; but starting at the beginning, we can trace the cases to a certain point beyond which we can not follow the infection in every instance. In New York City we have an epidemic, with the lines of ramification numerous, and it would seem to be almost impossible to follow them up; but a great wave is going out from New York, and it is traveling in all directions. It seems to me that these suggestions of the lines along which we may best investigate, and what we may best investigate, may be worth while, and that is my apology for asking to be heard for a few minutes.

We had reports yesterday of this epidemic spreading out from New York City, and from every State we have had reports of cases of sporadic type, so called. Dr. Williams has called my attention to the fact that the cases in Virginia are in the most isolated districts, in the mountains, and almost always well off the railroads; they are single cases, and do not spread. Now, is this the same disease as the epidemic form? If it is not the same disease, why have reports of these sporadic cases any more than to have reports of cases of scarlet fever or measles in connection with poliomyelitis? So that it seems to me that establishing the one fact, as to whether these sporadic cases are really the same disease and due to the same virus, is tremendously important. If we prove that they are not the same, that the virus is different—and I believe it can be readily established one way or the other through monkey inoculations—then we

do not need to adopt these rigid rules of quarantine in connection with isolated cases, which do not spread any way, even when nothing is done. If, on the other hand, we find that the virus is identical, then there is the question to settle, How did a single case get into a county when there has been no communication with the outside world? Once getting there, why did it not spread, when the disease appears to be so terribly infectious in New York in this epidemic?

It seems to me that this line is tremendously important, and that we should, just as soon as possible, have the necessary experiments to determine whether the virus in sporadic cases is the same as the virus of the epidemic cases, and whether we are dealing with the same disease. It appears to me that the place further to study the disease is on the edge of this advancing wave, where we undoubtedly get the epidemic form of the infection. I must confess that purely on *a priori* reasoning I can not see how this thing is a contact disease. I know it takes a great amount of bravery, and perhaps even foolhardiness, to say this; but we have the most extraordinary spread from house to house, and yet we have failure in the majority of cases, where conditions would seem to predispose to the dissemination of the infection in instances where there is kissing, fondling, and where the secretions are distributed in the greatest amount.

We were told yesterday by Dr. Frost that in 5½ per cent of the cases they could plainly trace contact, in 11 per cent contact was doubtful, and that by straining everything and counting every case where contact was possible, they could get but 22 per cent due to this cause. Then, how about the other 78 or 89 or 94½ per cent? If the infection goes from house to house, as it does, if it gets into isolated districts, as it does, and if we are dealing with a single disease, there must be some intermediate link. None of us can say whether it is insects, cats, dogs, or what not, but there must be some intermediate thing that is going to carry the infection from this house across the street, or across two back lots, and yet is not going to spread it right in the house among children who have fondled, kissed, and exchanged secretions in the most liberal manner possible. The investigation of these sporadic cases is, it seems to me, a very profitable line of research. If the sporadic cases turn out not to be the same as the epidemic cases, we do not need this rigid quarantine. If the virus is proved to be the same, then we know there must be in New York City and other places where the disease appears in epidemic type, something which is causing its spread. If it be an insect, let us say so. If it be contact, how can we explain failure to spread in the house, with rapid dissemination elsewhere? We can explain it first of all by susceptibility being uncommon. But where would we look for the greatest number of susceptible children?

Why, necessarily, among those of the same heredity; in the brothers and sisters of affected children. It would seem that some intermediate factor plays its part, and by studying these sporadic cases which do not spread and their environment, and contrasting them with and studying everything in the epidemic cases and their environment, we will be working along a fruitful line of research.

I want to thank you very much for giving me this opportunity to bring forward these points. I do not know whether they are worth anything, but to me they seem to be somewhat suggestive. [Applause.]

The CHAIRMAN. Is there any other matter to come before the conference?

Dr. WOODWARD. This might be converted into an experience meeting, but I think it would hardly be worth while putting this into the record. I have mentioned two cases which have occurred here within the last two weeks. One case occurred in one of our hotels and was probably imported from New York. It was promptly removed to the home of the attending physician, who was a relative. Some little while later a second case was reported, and inquiry showed that the mother of that patient was employed in the hotel. It was stated that she never had had occasion to visit the room of the first patient and had nothing to do with the case, being assigned to a different floor. Careful inquiry, however, disclosed the fact that on one occasion she had assisted the maid on the floor where the first patient had been in preparing the washable articles for the laundry, including those from the room of the patient. She has never shown any evidence of poliomyelitis, and up to the present time the investigations made have not disclosed that she is a carrier. Was the second patient a contact case from the New York patient?

Dr. ALBERT. In the absence of Dr. Frost, I would say, with reference to investigations of contact cases, the impression left by Dr. Levy was that in some cases only 5 and in other instances 10 to 20 per cent of the cases were contact cases. Dr. Levy asked what was the source of infection in the other larger percentage of the cases. If I remember Dr. Frost's report correctly, it was that of all of the cases of children in contact with poliomyelitis, only 5 per cent contracted the disease, or, considering some of the so-called abortive cases as suspicious, 10 to 20 per cent contracted poliomyelitis.

The CHAIRMAN. Is there any further discussion to come before the conference?

Dr. PORTER. Mr. Chairman, before the conference closes I want to offer a resolution, something on the line of that which I offered yesterday and withdrew—did not retract, as I thought I did, but withdrew—until the reports of the different committees had been sub-

mitted. We have now listened to those reports with a great deal of interest. They have been carefully prepared, and the framers are entitled to a great deal of credit for the prompt manner in which they have submitted them and the points which they have brought out. But they are rather lengthy for those who are going home to give to their people.

Mr. Chairman, while physicians, we are health officers also. The health officer and physician, while embodied in the same person, are two entirely distinct and different individuals. The health officer deals with disease so far as it is a menace to the general public, and it is his duty to protect the public. The physician is interested in the cure of disease. To the health officer it makes no difference whether the patient lives or dies, so long as the public is protected. Now, it seems to me that a concise statement of what we have done here and of our conclusions might be of some interest, and I submit the following for what it is worth:

Resolved, That it is the sense of this conference of public-health officials and of the United States Public Health Service—

1. That, although the producing cause or causes of infantile paralysis, or anterior poliomyelitis are not as yet definitely known, for in some instances individual and isolated cases of the disease do not seem to impart contagious qualities, and in other instances they have highly communicable and contagious properties, this being confusing both to the medical profession and the public, yet this conference is firmly of the opinion that infantile paralysis should be easily recognized and should be isolated and treated, either in homes or hospitals, preferably the latter, until more of the producing cause or causes are known.

2. This conference does not believe that quarantine—and by this is meant the interruption of travel—is at all necessary and discourages and frowns upon any procedure of this kind or character.

3. That it believes that supervision should be exercised over discharged travelers from known infected centers in order that they may be daily watched when arriving at points of destination, when so informed by the United States Public Health Service, and that sickness occurring among such children, of whatsoever nature, should be closely inquired into, that an early determination of the true character of the illness may be arrived at and prompt action taken to safeguard the public.

It seems to me that is the consensus of opinion, concisely put, of this conference.

(The resolution was seconded.)

The Chairman. You have all heard the resolution, and it has been seconded.

Dr. Albert. Did I correctly understand Dr. Porter to say that quarantine was not necessary?

Dr. Porter. Yes, sir.

Dr. Albert. A little while ago we adopted regulations providing for quarantine.

Dr. Porter. No; they provided for supervision over travel cases; quarantine, yes.

Dr. Albert. You have not that word in there.

Dr. Porter. Well, it can be interposed.

Dr. Burkart. Well, it should be interposed before we vote for it. Will you read that again?

Dr. Porter (reading):

This conference does not believe that quarantine—and by that is meant the interruption of travel—is at all necessary.

Dr. Swarts. Leave out the word "quarantine" and put in "interruption of travel except under the rules already adopted."

Dr. McKelvey. I believe we all appreciate the good motives of Dr. Porter in offering this resolution, but we are mixed up enough in what we have already passed. I have voted for what has gone through as a whole, and I do not believe we want to go before the people with too many stories, conflicting resolutions, and statements. I am of the opinion that every member here will be able, when he returns home, to give his people an intelligent statement of the proceedings of this body and what has been done, and I do not believe that we want to rely upon any additional resolution at this time. Therefore I am opposed to any further resolutions of that character.

Dr. Williams. Mr. Chairman, it seems to me I can not agree with Dr. McKelvey, because much has been said that is pretty definite. It has been stated that the infectious virus is in the secretions of the nose and the mouth and in the intestinal secretions. That is a big point. As to the various means of this transfer from one person to another, that has not been so thoroughly determined. We know that 90 per cent of the cases have been in children under 10, 5 per cent between 10 and 16, and the other 5 per cent above that age. We have pretty definite directions based on this knowledge, and it seems to me that we can just give to the press these committee reports, the three which have been approved, and that that will be sufficient. If any State health officer wants to abstract these or make a press report based upon them he is at liberty to do so, but it seems to me that the resolution which has been read by Dr. Porter will very decidedly cause confusion, especially after the definite reports which have been submitted.

The Chairman. Is there further discussion of this resolution?

Dr. Porter. Mr. Chairman, there is no desire on my part to thrust anything for further consideration on this conference, but I do know that these reports that have been submitted on interstate communication and supervision of travel and the care of the individual patient are too voluminous to be gotten into the public press and before the people, who are already confused on this subject. I have

merely attempted to put into concrete form what has been arrived at in the discussion.

Dr. COLLINS. A question for information, if you please. These reports will all be summed up in the bulletin? I understand that to be the case.

The CHAIRMAN. They will all be published in book form.

Dr. COLLINS. I mean as a whole?

The CHAIRMAN. The entire report of this conference will be published: the remarks of all you gentlemen, and everything connected therewith.

Dr. PORTER. That is all true, that these reports will be published and that health officers will receive them, but the general public of this country will not get them. They do not see them unless they write here and through the courtesy of this bureau are furnished a copy.

The CHAIRMAN. I will say, for the benefit of the conference, that we have not been without newspaper men since we started, and the newspaper men have kept pretty close track of what has gone on here, and have published fairly accurate articles on what has happened.

Dr. RANKIN. The reason I have not enthusiastically seconded my friend's resolution here is because I am going home to publish my own statement, and I am afraid that my report might not altogether agree with that. I am going to tell the folks that we do not know a "blooming thing" about it, and I am going to tell them that there is a greater incidence now in the cities, with all of your control, than there has been in the cities in the past, with no efforts toward control. I am going to tell them that the present methods are worthless. Now, if the conference wants to go down into North Carolina and give the folks there the idea that something can be done, all right; that is, you folks are going to give them the idea that you can do something, when as a matter of fact you can not do anything, and you know it.

Dr. PORTER. No; I beg your pardon, Doctor, I did not say that in the resolution. I only say there what we should do; and I think there should be some supervision over child travel. Now, whether it is done by the Public Health Service or by the individual States I do not know. In my own State—I can speak authoritatively on that subject—we examine all people coming in on through trains and on steamboats from northern points. We do not interrupt travel, but we exercise supervision over child travelers, and the municipal authorities are notified so that they can continue the observation and inform the executive officers of the State board of health if anything unusual happens. Now, I think that is about all that we can do.

Dr. BURKART. I call for the question.

The CHAIRMAN. The question is on the adoption of Dr. Porter's resolution.

(The question was taken and the resolution was not agreed to.)

The CHAIRMAN. The noes seem to have it; the noes have it and the resolution is lost.

Dr. WOODWARD. Mr. Chairman, there has been great benefit to those present by these interstate regulations being so promptly mimeographed and distributed. I wonder if it would not be possible to have those on local quarantine prepared and mailed, perhaps, to-morrow.

The CHAIRMAN. That will be done. I have asked Dr. Drake to dictate them immediately to a stenographer, and to-morrow morning they will be gotten out and mailed.

Dr. RANKIN. That will include also the forms that Dr. Lavinder and others have formulated?

The CHAIRMAN. Yes. Is there any further business to come before the conference? If not, a motion to adjourn will be in order.

Dr. BURKART. I move that we adjourn.

(The motion was seconded, and at 4 o'clock p. m. the conference adjourned.)

○

Fitzgerald

TREASURY DEPARTMENT
UNITED STATES PUBLIC HEALTH SERVICE

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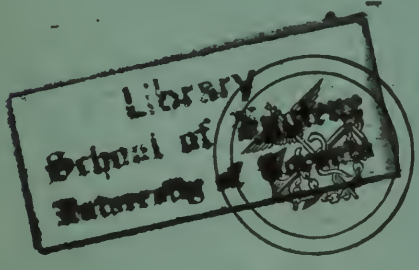
PUBLIC HEALTH BULLETIN No. 84
DECEMBER, 1916

IS MOSQUITO OR MAN THE WINTER CARRIER OF MALARIA ORGANISMS?

By

M. BRUIN MITZMAIN
Technical Assistant, United States Public Health Service

PREPARED BY DIRECTION OF THE SURGEON GENERAL



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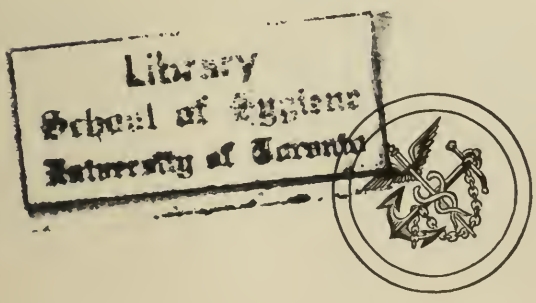

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ILLUSTRATIONS.

FIG. 1. Map showing individual plantations of the Mississippi Delta Planting Co.

2. Upturned root mass of fallen tree where a few specimens of *A. quadrimaculatus* were found amongst the exposed root fibers on March 28.

3. Excavation made by falling tree exposing roots, pool of water beneath. Here, in February and March, culicines were found in larval and pupal stages and emergences observed. *Anopheles* absent.

4, 5. Method of searching hollows in standing and fallen timber for hibernating forms. The tree shown in figure 5 was seen to harbor many *Anopheles* in September, 1914.

6. A hole in a hollow tree receiving sulphur dioxide fumigation.

7. Showing understructure of plantation houses, which are found to be fruitful sources of hibernating *Anopheles*.

8. Showing understructure of plantation houses, which were found to be fruitful sources of hibernating *Anopheles*.

9. Dr. M.'s house, showing means of access by mosquitoes through lattice work and holes in brick understructure. Under this house the first hibernating *Anopheles* were collected during the first week of February.

10. Typical cypress trunk with fissured structure in which leaves found lodgment to serve as possible hiding places for resting anophelines. Such places were not found to shelter mosquitoes.

11. Canvas-covered canoe, which remained undisturbed during fall and winter. Shows the ripped canvas in the end of the canoe where several inches of water remained. No mosquitoes of any stage were seen.

12. Showing the method adopted by use of horses as bait to attract anophelines in the woods.

13. An inundated "borrow pit" on Whitehall plantation. *Anopheles* larvæ were not found here during February.

14. Junction of Deer Creek and Lake Bolivar, where in late fall larvæ and pupæ of *A. quadrimaculatus* were found. Seven persons among the fishing women on the bridge proved to be winter carriers of *Plasmodium*.

15. Group of negro tenants on Lake Vista plantation. No case of sickness reported here, yet 43 per cent were carriers of malaria during February and March.

16. Group of tenants on Myers plantation. 50 per cent were infected with malaria during February and March. No clinical case observed. The head of the family proved to be a gamete carrier.

17. Showing apparently healthy negro tenants of Mound plantation engaged in clearing operations. Five of the eight men in this picture were winter carriers of malaria; two of these harbored gametocytes.

18. Photomicrograph of a stained preparation showing young oocysts on the stomach of an *A. quadrimaculatus* dissected May 15, 1915. This represents the initial infection of the spring season.

19. Enlarged view of portion of figure 1.

IS MOSQUITO OR MAN THE WINTER CARRIER OF MALARIA ORGANISMS?

By M. Bruin Mitzmain, Technical Assistant, United States Public Health Service.

The potential hosts, mosquito and man, were studied to determine the carrier responsible for the perpetuation of the malaria organism during the inactive period of winter. An effort was made to show where the causative agent of malaria remains latent in localities having a dormant season, during which the anopheline mosquitoes hibernate. The results of this study are given herewith. The solution of the problem is aimed at because its economic importance appears to be not inconsiderable, judging from the discussion devoted to it by many writers on malaria epidemiology.

LITERATURE.

The available references in the literature on this problem of hibernation are as follows:

Herms (1915) has given probably the best exposition of the relationship of man and mosquito in regard to the question, "How does the malaria parasite overwinter?" He is quoted as follows:

"Since malaria has a typical seasonal occurrence, with little or no appearance during the winter months, the question arises, Does the parasite overwinter in its human host to break out in the spring in individual cases by the process of parthenogenesis, or does it overwinter in the body of the mosquito? The weight of evidence is against the latter possibility. The writer believes that the *Anopheles* mosquito seldom or ever takes a suck of blood before going into hibernation. A suck of blood would militate against the life of the mosquito inasmuch as it causes the development and ultimate extrusion of ova and that terminates the life of the insect. Other physiological reasons, involving further increased metabolism, seem to discount the possibility of successful hibernation. Furthermore, the writer has seen great numbers of voracious *Anopheles* in the spring both indoors and out, and has been frequently bitten by these as have many others without becoming infected. These hibernated individuals on coming out early in the spring bite viciously even at noonday. Furthermore, evidence that infected mosquitoes exist during the winter months seems to be lacking or has been overlooked.

"On the other hand, latent human infection has been amply proved, and this may easily lead to the infection of the mosquitoes appearing in the early spring and thus lead to the spread of malaria as the season advances."

Evidently, there is some disagreement among certain authors in accounting for the recrudescence of malaria during the winter.

Stephens (1908) states that the recurrence of isolated cases of new infections with malaria in Italy during winter and spring is attributed to the agency of the hibernating anophelines. In the early months some of these may fly abroad, as early as February on warm days, and further, as Koch pointed out, in certain houses where *Anopheles* exist the temperature is high enough to allow the development of the parasite in the mosquito. "One fact, however, has not been established, that these hibernating anophelines actually do contain sporozoites in their salivary glands; and in fact, according to Schoo, of Holland, they do not. MacDonald's observations in Spain were also negative in this respect."

Manson (1901), with his usual insight, sums up his knowledge of the problem in stating that in countries in which there is a cold season, during which fresh malarial infections do not take place, the infection of the next warm season is probably, in most instances, started from a relapse of a previous infection. "It has not been shown that the malarial parasite can retain its vitality in the mosquito during the hibernation of this insect."

And again Manson (1914) explains the improbability of sporogonic cycle under circumstances of hibernation by the statement that one of the most important conditions necessary to the sporogonic phase of the malaria germ is a sustained average temperature of at least 60° F. "The malaria parasite will not develop in the mosquito at low temperatures."

Deaderick (1911) expresses his views as follows: "How is the existence of the malaria parasite perpetuated? Why does the disease become extinct over winter when there are apparently no mosquitoes to further the life history of the organism?" He believes that it is possible that in a few instances the parasites persist in the bodies of hibernating mosquitoes. "While some investigators have led to a different conclusion Martirano found in the neighborhood of Rome, as late as the middle of March, that from one-fifth of 1 per cent of *Anopheles* were infected." Deaderick concludes that latent or chronic malaria will furnish the solution.

Henson (1913), writing of the limitation of the rôle of wintering *Anopheles*, states that, relative to climatic conditions, it has already been shown that in many sections of the world following the winter months malaria has been eradicated, and that before mosquitoes are again capable of producing the infection in man it is necessary for them to feed on the blood of infected man—that is, blood containing the sexual forms of the parasite.

Mitchell (1907), on the authority of Dr. Johnson, believes that the malaria parasites have their winter quarters in the human body, because the female mosquitoes do not make a meal before hibernating. These, however, quoting Dr. Smith, may bite during the winter in a warm house.

Smith (1904) describes the conditions applicable to the State of New Jersey as follows: "Breeding of *Anopheles* goes on until November in mild season, but early in October, or even in late September, specimens begin to seek hibernating quarters. As the insects do not feed before doing this, the malarial organism can not be carried over by them. The germ lies dormant in the human blood, and, in a partly cured case, there may be no active symptoms of the disease, while yet the gametes or reproductive bodies are present. Such cases as these Italian laborers have started malarial trouble in several New Jersey localities theretofore exempt."

Scheube (1902) summarizes the views of several authors relative to hibernation as follows: "It therefore follows that the same kind of mosquito may be

harmless at a low temperature but may become dangerous when the temperature rises. The mosquitoes in zones of moderate heat are driven into houses, huts, stables, etc., during the winter, and the parasites then perish. In the spring, however, the mosquitoes reinfect themselves from patients who are suffering from relapses, which, thus as it were, form the connecting link, the bridge between the fever time of one year and that of the next."

Scheube states that Celli and Del Peno found in the Campagna that the fevers of March to the end of June were relapses of former infections; that toward the end of June, the first infected *Anopheles* were found, and their number increased in July and August.

The foremost American sanitarians regard the question of continuance of infection by means of hibernating mosquitoes as unsettled.

Von Ezdorf (1915) writes as follows: "Mosquitoes do not bite, and are inactive when a temperature of 15.5° C. or less is reached. At this or lower temperature the mosquitoes begin to hibernate, finding protection in garrets, under houses, in hollows of trees, etc., but if the weather should moderate and become quite warm, as happens in our southern States, the mosquitoes may again become active; it is known that endemic outbreaks of malaria have occurred in the winter months, but whether due to infected hibernating mosquitoes or to relapses is not known. It has not yet been definitely determined whether the infected hibernating mosquito carries over the infection from winter until spring.

"In the winter months cases of malaria which occur are usually relapses from previous infections. The influence of cold in these relapses produces a lowering of the vitality in the individuals, and thus favors the renewed invasion of the parasite."

Craig (1909) is quoted as follows: "In temperate and cold regions they may pass through the cold season as fully developed adults, as larvæ, or even in the ova. According to Theobald, the fertilized females of *A. maculipennis* hibernate in the adult stage in cellars, outhouses, stables, etc., while *A. bifurcatus* and *A. nigripes* exist throughout the winter in the larval stage even under thick ice. If a warm spell occurs during a winter some of the hibernating mosquitoes emerge from their hiding places and bite, thus causing outbreaks of malaria during the winter season."

Regarding the hibernation of the various stages of *Anopheles* in a restricted biological sense, a review of the literature is given as follows:

Patten and Cragg (1913), alluding to the longevity and perpetuation of the anophelines, state that the commonest method by which this is brought about is by the hibernation of impregnated females, which, finding the season too far advanced to complete the maturation and deposition of their ova, seek out resting places and remain concealed until favorable conditions present themselves at the commencement of the next season.

Nuttall and Shipley (1901) cite that *A. quadrimaculatus* is recorded by Grassi as congregating during the winter in houses, huts, and barns in southern and central Italy. Only the imagines are found and no larvæ. The larvæ of *A. bifurcatus* were found in these localities. Grassi assumed that these latter may not have hibernated but were derived from late-laid eggs.

Nuttall and Shipley, commenting on their own work, state that in laboratory experiments in England larvæ collected in summer were allowed to develop; that, while those of *A. bifurcatus* remained alive during the winter, all the larvæ of *A. quadrimaculatus* died. They remark that "whether the larvæ of *A. quadrimaculatus* are capable of hibernating or not can not be positively stated, although it would appear unlikely, judging from our observations and those of Grassi."

Nuttall found that *A. quadrimaculatus*, which hibernated in the winter in Cambridge, was observed to disappear in May, "no doubt to oviposit and then to die."

Grassi (in Nuttall and Shipley, 1902) says that he has never found the males of *A. maculipennis* hibernating but only the females, all of these being fecundated. They begin to disappear in February, in Italy, and vanish to a greater extent in March when at times none are to be found. These insects have, presumably, flown out and died after depositing their eggs.

Austen (1901) cites his observations in England as follows: "In colder climates, on the other hand, impregnated females survive the winter in some suitable retreat in a state of hibernation, during which they take no food, depositing their eggs at the commencement of warmer weather."

Annett and Dutton (1901) in the course of their observations on the hibernation of English mosquitoes never found any of the mosquitoes in stables and cattle sheds, as these places were comparatively dry and warmed by the animals at night. Not a single male *A. maculipennis* was seen during several months in the winter. This fact they interpret as indicating that it is the female alone that hibernates.

Stephens (1908), writing on the length of *Anopheles* life, states: "It was originally supposed that mosquitoes, when they had laid their eggs, died. The observations are, however, probably true of these mosquitoes which have hibernated during the winter (in a fecundated state). On the return of spring they sally forth and lay their eggs and die."

Stephens assumed that the hibernating *Anopheles* are all females and these are always fertilized; that the females, if roused from their sluggishness by bringing them into a warm room, will feed, and after a time lay eggs; if, however, the temperature be kept low, they do not arouse themselves and do not feed.

Giles (1902), referring to the seasonal inactivity of *Anopheles*, states that this habit is spoken of as hibernation, and in Europe, where the males apparently all die before winter has fairly set in, only impregnated females survive the winter, "and it is through their agency alone that the continuity of the species is maintained."

Howard, Dyar, and Knab (1912), are quoted as follows: "With the majority of the species of mosquitoes the unfavorable season is passed in the egg state. Certain genera, however, pass the winter in the adult state. In such cases it is only the female that survives, having been previously fertilized, to deposit her eggs at the beginning of another season. It is certain that, at least in the genera *Culex* and *Anopheles*, no males survive the winter. The hibernating females seek shelter with the approach of cold weather, and at this time they show no inclination to feed. Those species more or less associated with man take advantage of the shelter of cellars, stables, sheds, and other outbuildings, the darkest ones apparently being the most favored. They have also been found hibernating in caves. Other species retire to hollows in trees, crevices in the bark, or other protected situations. There they remain quiescent until the return of the warm weather, closely hugging the surface upon which they rest."

Rosenau (1913) remarks: "The way in which mosquitoes manage to pass through the rigors of the winter probably varies with the different species. Some, like the malarial *Anopheles*, hide in sheltered cellars or dark nooks, or hibernate in other out-of-the-way places. Other species survive through the power of the larva or egg to resist cold, for the larvæ or eggs of some species will hatch even after they have been frozen."

Shipley (1915), writing of the eggs of the *A. quadrimaculatus*, states: "There is no evidence that they can survive throughout the winter period. Everything that we know indicates that the egg must pass the period within the mother's body, and that they only attain maturity in early spring, when the weather becomes warmer."

It will be noted that there is a marked unanimity of expression indicating the belief that the mosquito phase of the overwintering of malaria is a negligible factor. These opinions are, to be sure, based on epidemiological data and show a uniform absence of experimental proof. However logical these expressions appear to be, the fact remains that the problem can not be dismissed as settled until further experimental data are presented.

OUTLINE OF WORK.

At the outset of the present work it was necessary to secure data contributing toward the solution of the following: In what habitat in the region under observation did anopheline mosquitoes hibernate? When did this occur, and under what limitations? In what form (egg, larva, pupa, or adult) did anopheline mosquitoes pass the winter? What were the effects of temperature on the activities of the hibernating mosquitoes? Lastly, did anopheline mosquitoes harbor any form of the malaria organism during the dormant stage?

A persistent effort was made, during February to June, 1915, to collect as much data concerning these points as was possible.

A district comprising 15 plantations of the Mississippi Delta Planting Co., in Bolivar and Washington Counties of northwestern Mississippi, was selected for the purpose of this study by Surg. R. H. von Ezdorf, in charge of malaria investigations of the Public Health Service until his death in September, 1916.

In a general way the places inspected were those known to have harbored *Anopheles* mosquitoes during the season when malaria was prevalent. The plantations selected for domiciliary visits were the most heavily infected of the 15 plantations, the malaria index registering, at one place at least, as high as 58 per cent in September, 1914. The following record gives the details as to the character of the places visited and the opportunities for infestation presented. Routine inspections were conducted in this manner for a period of six weeks, beginning February 5, 1915. During the first two weeks the writer had the cooperation of Sanitary Engineer Le Prince, who was assigned to field studies. His notes are incorporated in the account appended.

NOTES ON FIELD EXAMINATIONS.

February 5, 1915.—Examined interior of buildings and outhouses connected with Dr. M.'s residence. They included ice house and harness room, which were very dark and tight (wind proof), but accessible to mosquitoes. The former

was found with one opening, about 6 by 2 feet, partially protected by a torn screen about 5 feet from the ground, one entry door, always closed when not in use. Ice house contained cotton sacks, boards leaning against the wall, and empty boxes and barrels. The harness room was well constructed (size 4 by 6 by 10 feet), wind proof, but would admit mosquitoes at all times. We examined the stable, containing cotton sacks, boards, exposed shingle roof, cornstalks used as bedding for stock, underside of feed trough in mangers, high and low rafters, and ceiling of shingles above them.

One old abandoned barn east of Dr. M's house contained a flat-bottomed boat and wooden canoe with canvas compartments. The floor of this structure was covered with cornstalks about one to two inches deep; it was not used except for storage of unserviceable waste and such odds and ends as old stoves, tin cans, large and small bottles, loose wire screen, boxes, worn-out stovepipe, and two baby carriages. These were stacked in a disorderly heap in the corner of the building in a pile about 8 by 8 by 4 feet high and offered many excellent hiding places for mosquitoes. The flat-bottom boat had the rear seat boxed in for a length of 2 feet; a board of this box was torn off, so that its inside compartments might be carefully inspected—results negative. The canoe was interesting and offered excellent wind shelter for mosquitoes. We ripped open the canvas compartments and took a photograph of the boat. While this was being done, it was noted that water 6 inches in depth filled the lower end. The stored canoe was resting at about 30° to the horizontal, so that water collected at the pointed end of one of the compartments. Anopheline larvæ were absent.

About a quarter of a mile from the house we examined the grove of trees surrounded by cotton fields. We examined the interior of six large hollow trees—one was 4 feet wide inside—also the interior of 15 hollow logs and 22 live trees with big vines growing on them. The trees were buttressed at the trunk, offering excellent wind shelter. The vines had diameters up to 2 inches and many hairy roots to grasp the tree's bark and would afford an insect much protection. One oak tree had hollows in upper portion of roots and they were examined by striking matches and illuminating the interior.

Next, examined negro cabin—back, inclosed porch with lots of stuff stored, including parts of wooden bed which were leaning up in a corner, and cracks between logs of back wall of house inside of balcony—then examined corn storage shed with wooden shingle roof. Results negative.

February 6.—Examined the premises of plantation manager, Mr. R. L. The residence was inspected within and under, and the near-by barn was likewise inspected. It was noted that a leafy vine, suitable for mosquito harborage, covered the sides and roof of the main building. Two large animal sheds with moss-covered roofs were examined. A small bell tower near cow barn also received attention. The inspection included a near-by cotton gin and warehouses. Mosquitoes were absent generally.

February 7.—Spent the entire day in wood and cypress and oak swamp near Dr. M's estate. At the present time the swamp is being drained and the woods cleared. During the summer of 1914, a moderate number of *Anopheles* larvæ were collected in this swamp. We inspected the contents and surroundings of 72 cypress and oak trees and stumps with loose bark and worm-eaten interiors, many partly hollow and in a state of collapse. These were torn apart for more careful examination, as they offered numerous excellent hiding places for mosquitoes. We found piles of leaves in some instances heaped to the trunks and crotches and covering fallen logs. These were examined minutely. The loose bark on cypress stumps was observed to be so placed as to afford excellent shelter from rain, sun, and wind. A special effort was made to ascertain the

presence of hibernating mosquitoes in this seemingly favorable environment, but all search was fruitless, although 17 harborages of this nature were carefully scanned. In many of the cut trees the roots were submerged in a natural basin of water, suppyling moisture to about one-third the length of the interior of the hollow stump. In other stumps, decomposing in the interior, the tops were found to be open so that the interior of the tree stump formed a natural tube to which the rain had access. In still others, which were hollow to a considerable distance, they were entirely protected from the rain and moistened only from rain-soaked soil at the roots. Many stumps, seemingly sound externally with solid bark, were rotted in the interior, and had numerous channels made by burrowing insects, and holes made by owls, woodpeckers, and rabbits, thus seeming to furnish conditions attractive to resting mosquitoes. In many of these the entire bark was cautiously stripped to expose the interior, when the holes and air spaces were minutely inspected. Other trees were carefully inspected for mosquito infestation; some old trees with hollows exposed to the wind found isolated in cotton and corn fields, as well as trees and stumps in the interior and on the edges of the swamp; also the tree stumps and trees in the heart of the dry woods. The hollows of some of these trees extended into the roots, the spaces of which were prodded with sticks. Also 22 fallen trees had their bark removed, and the surrounding accumulation of leaves and wood pulp were well scrutinized. No mosquitoes were seen in these natural environments, though they were apparently suitable resting places, and indeed, in several of the places inspected, mosquitoes had been found previously during the time of mosquito activity.

February 8.—It was noted that as late as 7.30 a. m. there was a coating of one-eighth to one-fourth inch of ice in the road side ditches.

Inspected the environs of a large frame building, fitted up as a general store and post office. The interior, which was dark in the early morning, was seen by the aid of an electric flash light and an oil lantern. Here numerous situations, ordinarily favorable to mosquitoes, were encountered. The building was unusually dark at all times, the only sources of light being obstructed by broken shutters fastened securely. The ordinary accumulation of empty barrels and boxes glutted the available storage space. Several of these were superimposed, so that the lower as well as the upper one was accessible to mosquitoes. Empty sacks in the corners and loose boards leaning against the wall, as well as a large empty piano packing case, were inspected. The vacant spaces, on 36 feet lengths of shelving and under the numerous counters, were examined carefully, with negative results. An adjoining wreck of an abandoned barn, once utilized as a blacksmith shop, but now inhabited by a family of swine, was given careful consideration, with no better results.

Following this the interiors of nine negro cabins were examined. All of the inhabitants agreed that mosquitoes were not found in their houses during the cold season. These persons were offered 25 cents for each mosquito found during our visit and subsequently, but without return. We inspected the cracks in these log houses, under shelving, under loose wall paper, the wooden ceiling, and sacking suspended therefrom, also furniture, beds, and loose boxes littered about the floors. The inspection included the underside of these houses. No mosquitoes were found.

February 9.—Ice about 8 a. m., melted by 9 a. m., warm at noon—about 14.5° C. to 15.5° C. in shade.

Caught the first mosquito since arrival. Several (9) captured in short time under the house of Dr. M. at 2 to 2.35 p. m. Captured six on north side of house, some flying away at our approach and settling again near by; two

of these escaped by flying away from the house. Two mosquitoes were captured on strands of cobweb. One was taken while resting on brick support. The remainder were collected from surface of wood, usually near a moist place.

Inspected Eastland estate, 2 miles north of Scott. Under the manager's residence the entire flooring was inspected. In this particular locality in September, 1914, Mr. Le Prince had counted as many as 30 *Anopheles* to the meter. Two chimney supports under the house were likewise inspected, but no mosquitoes were found. The several outhouses, horse shed, and hay loft yielded nothing. Four hollow trees were examined; two were subjected to sulphur dioxide fumigation. This was done by spreading white paper over the ground inside of the tree; bricks were placed on this supporting an iron pot containing sulphur and alcohol. Stiff paper, held in place by boards, effectively covered the opening. The hollow in these trees extended fully 15 feet, so that it was necessary to apply the sulphur fumes for a long period. After several hours the pot was withdrawn and paper and interior of tree were inspected, but no mosquitoes were found. The only living things seen were six small, stupified flies, collected from the layer of paper.

February 10.—Inspected a large number of houses on Belmont plantation. Several *Anopheles* were taken in the bright light under the plantation manager's house; most of these were seen on the flooring near the walls.

The first general mosquito infestation was noticed on February 11, beginning at 4.30 p. m., in the woods of Mound plantation. Here, while making an inspection trip with three other horsemen, *Anopheles* were observed biting our horses, particularly on the sides exposed to direct sunlight. It was noted that the flight was from northeast; that there was a moderate breeze from the southwest; and that the nearest settlement, comprising 45 dwellings, lay approximately three-eighths of a mile to the west, the direction apparently selected by the voracious mosquitoes.

Large numbers of mosquitoes were observed to be coming from the general direction of the depth of the woods, where the company's main drainage ditch was located. Prior to this time, and subsequently, at least once weekly for a period of three months, this body of water was scrupulously explored for any young forms of *Anopheles*. Immediately following the general infestation, a special and conscientious effort was made to locate empty puparia, to account for the emergence of such a swarm of mosquitoes. Absence of these or other young forms was invariably the rule.

On the following day, February 13, mosquitoes were still present in considerable numbers, but few were found a month thereafter. In fact, a relatively warm day was required to induce biting, although horses were used to bait the mosquitoes. Between March 6–13, only 14 *Anopheles* were collected from two plantations, but the two following days proved to be warmer, when 69 specimens were collected from a horse used for the purpose. Biting the horse did not begin usually until nearly 3 p. m. upon these and several other occasions. The mosquitoes were seen to come from the direction of the near-by

swamp, attacking the horse on the side away from the swamp, biting in the sunlight.

It appears that some resting place other than under dwellings must be offered, to account for the hibernation of the swarms of anophelines which infest this locality during warm days in winter and in early spring. Several of these sites were actually devoid of resting mosquitoes, although the residents complained of them during warm spells. A notable example of this paucity of material was found in a residence inspected at Nugent plantation, about 4 miles north of Scott. Here the manager's residence, a commodious, substantially constructed, frame house, was examined on February 18. The house was situated about 50 meters from some swamp land, which was formed by the overflow of Lake Bolivar. The structure presented a floor space of fully 486 square feet of solid boarding. The height from the ground was 2 feet 6 inches, surrounded on all sides but one by latticework forming holes $1\frac{3}{4}$ inches in size. The remaining side was made of an unbroken brick wall. The supports, numbering 59, consisted of brick bases, with 5 additional brick bases supporting the fireplaces above. Five wooden stairways must also be mentioned, as ordinarily these shelter mosquitoes. At the time of examination the ground beneath the house was fairly dry, but covered with tin cans and dried leaves. Under the dwelling there was ample light to see the boarding surface and brick supports. No mosquitoes were found in any of these places. The swamp in front of the house was devoid of young mosquito life.

In this region the nearest approach to a house cellar was found, February 16, in the form of a dirt storm cellar, built alongside the residence adjoining an old ground cistern. Here no mosquitoes were found, although seemingly ideal shelter was offered. This is significant, because various authors state that house cellars offer good locations for hibernation.

Some clue as to the resting places of anophelines during early spring was afforded on the morning of March 28, while I was in the oak woods examining the upturned roots of a fallen tree. A few mosquitoes were noticed flying about in the light, one of which, an *A. quadrimaculatus*, was caught biting my hand. It was examined subsequently and proved to be negative for suspicious organisms. Several of the active mosquitoes alighted on the moist root hairs of the dead tree. A bird dog was induced to nose about the holes in the matted roots, with the result that it attracted the attention of several vicious *A. quadrimaculatus*. It was noticed that a small pool was formed in the excavated earth under the root mass, and here a moderate number of culicine larvæ were collected. Neither eggs nor larvæ of *Anopheles* were present.

Again, earlier in March while in the interior of the woods exposing myself to the attacks of *Anopheles*, I dislodged some mosquitoes from a young cypress tree. Upon closer examination I observed an *A. quadrimaculatus* female resting among the twigs. For several hours I repeated this experiment, vigorously shaking young trees in the cypress brake, and counted several mosquitoes, apparently anophelines, which were dislodged from their resting places. On the two following afternoons I brought a saddle horse to an open place near the cypress brake and in 30 minutes succeeded in collecting 24 *Anopheles* that alighted on the horse.

The evidence offered from the investigation thus far would seem to indicate that the majority of the mosquitoes captured probably hibernated in the denser portion of the woods. Here, protection from unfavorable conditions of temperature, winds, and moisture would be better assured. Doubtless, with suitable rise of temperature, anophelines become active, biting men and horses in the woods, being transported in a measure by these natural vehicles out of the woods to the near-by dwellings. Here they would again seek shelter, selecting the most suitable substitute for trees, namely, the large timbers under the flooring of the house, where moisture, darkness, and wind protection could be obtained. Here, upon the understructures, the anophelines were discovered in a quiescent state, the degree of dormancy depending on the time of day and the temperature. By the aid of the electric torchlight, these mosquitoes were studied under many houses, beginning early in the morning and throughout the day. From a dormant, sprawling condition in the cold forenoons, a gradual change of attitude and location was noted. Incidentally it was observed that the well-known attitude of "sprawling" was rarely assumed when the temperature was above 9.0° C. The usual attitude of the two species, *A. quadrimaculatus* and *A. punctipennis*, under the dwelling was seen to be with the body held nearly parallel to the perpendicular plane, close to the flooring with the head directed upward and the caudal end slightly raised. When the weather became slightly warmer, or when disturbed from the normal attitude, the mosquitoes were found suspended from above, nearly at right angles to the flooring.

A perceptible shifting toward the warmer and lighter side of the house was observed as the morning progressed. By remaining quiet for 30 minutes or longer, the observer was aware that the mosquitoes shifted from the understructures to the open spaces below. One would fly a meter or two, alighting on a beam near the outer wall of the house. If the weather toward noon was distinctly warmer, mosquitoes were seen to fly from beneath the dwelling into the open and in the direction apparently of the nearest trees.

On April 11 there was noted for the first time a perceptible disappearance of *Anopheles* from the woods, and coincidentally the resumption of normal parasitism, biting in the evening rather than in daylight. This was ascertained by a trip on horseback covering 14 miles through the woods and swamps. The horses were rested at frequent intervals, especially in regions where the greatest number of mosquitoes were collected previously. Only a few specimens of *Culex* and *Simulium* were captured.

The normal nocturnal biting habit was brought to the attention of the writer by the manager of Myers plantation along Bolivar Lake, a few miles north of Scott. Complaints of biting at night, and the presence of numerous anophelines in the corner of the screened house gallery, were definite proofs. This occurred during the last week of April and on May 2. It was assumed by the manager that the stiff breezes of recent occurrence drove mosquitoes which emerged from the waters of Kentucky Shoot, on the opposite side of Lake Bolivar, to the plantation manager's house, a distance of 400 meters.

A survey was therefore instituted to ascertain, if possible, the source of the *Anopheles* infestation on Myers plantation. A day was occupied in a small skiff, inspecting Lake Bolivar in the region of Kentucky Shoot. It was found that the latter was a shallow bayou 10 meters in width at its maximum, extending 500 meters through Isole plantation. Dense cypress extended on both sides of the stream, the head of which formed a stagnant swamp draining a ditch from an adjoining cotton field. The open woods along the banks of the shoot formed a pasturage for animals, seen grazing at the time of our survey. Near the mouth of the shoot, in the matted algæ and débris, a few *Aedes* larvæ were found. This form only was encountered for a distance of 75–100 meters, then larvæ of *Anopheles* predominated for a distance of 60 meters. An average of one specimen of *Anopheles* larva to two dipperfuls of water was collected. During the entire period of the inspection, *Aedes* bit us freely, but not a single instance of *Anopheles* biting was observed along the shoot or in the woods near by. While in the pasture land a few *Anopheles* were caught biting us and a grazing pony.

It was concluded from the two days' survey that some source other than Kentucky shoot was responsible for the *Anopheles* infestation across the lake at Myers plantation.

In the collection of 308 *Anopheles* made at Myers plantation at this time (on or before May 2) only specimens of females were caught, and these, in the majority of instances, showed ovaries distended with eggs. It was concluded, therefore, that the spring brood was not in existence before May 2, and that the mosquitoes encountered were probably, without exception, from the overwintered brood.

It was established beyond a reasonable doubt that the new spring brood was not likely to have received the initial infections of malaria. Certainly the females of the winter brood had greater opportunities to obtain human blood to the extent of at least two weeks antedating the appearance of the spring brood. During May 4–10 a special effort was made to collect specimens of the spring brood attacking persons in houses. Many houses of both whites and negroes were visited during this period and the writer exposed himself in an unscreened plantation house in order to collect specimens at first hand. In all this, while not a specimen of male *Anopheles* was seen, the females dissected were either fecund with developed eggs or supplied with masses of fat cells, indicative of matured mosquitoes.

In this search it was particularly noted that the mosquitoes prevalent observed their natural habits of biting and in the usual house infestation. In one morning's collecting 60 specimens of *Anopheles quadrimaculatus* were taken from a negro cabin located on the edge of a swampy woods. The residents, nearly all of whom had been previously infected with malaria, complained that the mosquitoes were so bad at nights as to interfere with sleep and that it was found necessary to resort to smudging. In the kitchen of this dwelling the smoke was very dense; here no mosquitoes were found.

As in previous collecting, no male *Anopheles* were observed, and many of the females were gravid and laid fertile eggs when kept in containers a few days previous to their dissection in the laboratory.

In one negro cabin typical epidemiological factors were presented. The house, of two living rooms, was occupied by 12 persons, 1 at least had crescents in her blood and at least 5 of the remainder harbored asexual parasites. The house was 300 meters distant from the neighbor's on the edge of a clearing in the woods, which in winter is ordinarily very swampy. The nearest trees were 25 meters away. The cabin and adjoining fowl roost yielded 145 specimens of *A. quadrimaculatus*. More than 100 were collected in a single room; 36 of them from behind one of the beds in which a child was then sleeping. A ladder was used to obtain the mosquitoes from the walls and ceiling. The walls were constructed of rough pine boarding and the ceiling of close-fitting finished lumber. No whitewash, as it is commonly seen, was used in this room. The mosquitoes were, for the most part, resting on objects of furniture, particularly upon the three bedsteads in the corners. A black umbrella alongside the bed yielded 3 mosquitoes, the headboard of a bed yielded 7, a spider web near the ceiling yielded 6, and the fireplace within the chimney yielded 12 mosquitoes. Many of these mosquitoes were seen upon the ceiling after being disturbed below. Several specimens were taken from the bed net which covered the sleeping child. The fowl roost yielded 35, and 9 were taken from beneath the cabin. The dis-

tribution of the 145 mosquitoes was as follows: 35 in the chicken house, 9 under the cabin, 101 within the cabin.

In order definitely to establish the fact that hibernation of *Anopheles* exists in this region certain conditions must be present. These would include the absence of propagation during the cold period; certainly no emergences should exist, or, obviously, the criterion for the overwintering of infections will be upset. The presence of eggs and young larvæ will somewhat complicate the findings unless it can be proved that these forms are lying dormant during the entire winter; otherwise certain calculations will be upset by the forthcoming new brood.

The absence of males appears to establish what is probably the most stable criterion of hibernation, or at least one which gives a certain indication that a new brood is not present. It has been observed, upon numerous occasions, and by other workers, that the product of the first emergences are usually males, and that the total number of the two sexes is approximately equal.

All of the evidence that it is possible to offer in this connection favors the assumption that the mosquitoes obtained in the months of February, March, and April are of the fall and winter brood.

In addition to this, a painstaking and persistent search was conducted for the eggs, larvæ, and pupæ of *Anopheles* throughout the watercourses and swamps of the 15 plantations situated in Bolivar and Washington Counties. Not before May 1 were *Anopheles* larvæ taken from the natural habitats, although larvæ were obtained under artificial conditions in the laboratory on April 21. These were produced from a specimen of *Anopheles quadrimaculatus*, caught while biting my arm on April 6 while in the woods. The specimen was captured and fed again April 10. It died April 16 while ovipositing, having laid 10 eggs in a glass dish containing water. The eggs hatched after five days, at an average noon temperature of 23.5°–26° C. This, however, is by no means a true index of what occurs in nature, as it has been possible to remove gravid females from a profound state of hibernation in cold weather and, after a meal of blood, to induce them to lay fertile eggs at room temperature. Certain inferences, however, may be drawn from this phenomenon, namely, that, unless we concede a parthenogenetic relationship, the hibernating females are doubtless fertilized sometime previous to the inactive period; that the males no longer functioning do not hibernate, that the appearance of males in the spring is a certain sign of the propagation of the spring generation.

The initial appearance of the young stages in nature occurred May 2, when larvæ less than twice the length of the egg were collected in several watercourses. Larvæ, in numbers enough to attract attention, did not occur until May 14, when they were found during a

survey of Black Swamp Bayou, on Lake Bolivar plantation, and Gin Bayou, on Nugent plantation. On the former location an ideal habitat was afforded among trees and floatage carelessly thrown into the stream. Many larvæ, one-half to nearly full grown, were collected on this day and only one pupa was seen. On May 15 this pupa emerged in the laboratory as a specimen of a male *A. quadrimaculatus.*

A moderate number of water containers used as traps, distributed throughout several plantations, were utilized in an endeavor to learn the time of initial egg laying and hatching. These were selected, primarily, either for the reason that larvæ had been observed in them in the previous fall and winter or because they were located in advantageous places. The containers were usually stationary vessels, some of which were filled with water, which was allowed to stand undisturbed; in others the water was replenished when necessary. They consisted of wooden water barrels, old boats or canoes serving as water troughs, old wooden drinking troughs full of rain water, iron cisterns, cement water troughs, fire buckets and barrels, and numerous ground cisterns. At least one of these was located on each of the various plantations and inspected regularly at intervals of from three to four days during the months of February, March, and April, when evidences of mosquitoes were absent from natural watercourses.

None of these produced eggs or larvæ until May 25, when, for the first time in this region, two large water barrels were found infested. One barrel contained 30–40 larvæ, 1 to a few days old, and the other harbored older larvæ to the extent of 20–25 specimens. It appears that container infestation generally follows propagation in watercourses. In two instances at least was this observed; one in which an old boat alongside a muddy ditch was not infested until two weeks following the appearance of full grown larvæ in the latter, and another in which wooden barrels kept on a house gallery 25 meters from a flowing stream did not harbor larvæ until 11 days following the infestation of the watercourse.

The finding of *Anopheles* eggs in streams under natural environments is conceded to be a difficult task, even when mosquito propagation is at its maximum, but the difficulties are manifold when attempting to locate these tiny objects during the winter period. The effort met with uniform failure, though, allowing for human limitation, *Anopheles* eggs may have been overlooked in the present studies.

As a partial control to this condition, experiments were conducted in the laboratory, apart from the hibernation investigation, during August 20 to October 15, 1915, to determine at what temperature *Anopheles* lay eggs and the nature of temperature requirements for their hatching.

The following table summarizes the results of these tests. The mosquitoes used were *Anopheles quadrimaculatus* placed in various compartments of two refrigerators, the temperature being carefully registered three times a day. The mosquitoes were captured specimens kept in lantern chimneys, the upper ends of which were closed with coarse bobinet and the lower ends immersed in water contained in flat dishes. The higher temperatures were secured from an electrically controlled, low-temperature incubator set at 19–21° C. and from living room and outdoor exposures at temperatures of 16–35° C.

TABLE No. I.—*Summarizing the results of egg production and hatching at various temperatures.*

Temperature C.	Number of mosquitoes used.	Results.	Duration of experiment.
4.5– 5.5	15	Negative	Sept.3–Oct. 15.
4.5– 6.5	62	Negative	Aug. 20–Sept. 6.
7.7–11.5	12	Negative	Aug. 20–Sept. 1.
9.5–12.5	12	Negative	Aug. 20–Sept. 6.
13.5–16.7	12	310 eggs. No larvæ	Aug. 20–Sept. 1.
19.0–21.0	12	425 eggs laid in 7 days. Fertile	Aug. 20–Aug. 27.
22.5–32.0	12	280 eggs laid in 4 days. Fertile	Aug. 20–Aug. 24.
21.0–33.5	12	700 eggs laid in 4 days. Hatching begun within 30 hours.	Sept. 3–Sept. 8.
16.0–35.0	14	800 eggs laid in 2 days. Hatching begun in 24 hours.	Sept. 3–Sept. 7.

The temperature tests were conducted during the period from August 20 to October 15, 1915. No cognizance is taken of the fate of the mosquitoes after egg deposition was completed. Interpretation of results in some instances must allow for the unpreparedness of females to lay eggs, although they were kept a reasonable length of time to encourage egg development. Therefore no significance is placed on the percentage of eggs laid at the different temperatures. As a check to the negative results obtained at temperatures included between 5.5°–12.5° C., the mosquitoes surviving at the termination of the tests were subjected to temperatures at which successful egg laying had been previously observed. These favorable temperatures were obtained in the room or outdoors varying from 16° to 35° C. Although eggs were laid freely their germinating powers were markedly enfeebled, since only 35 per cent to 75 per cent of the various lots produced larvæ.

It will be noticed that the temperatures 13.5°–16.7° C. produced 310 eggs, but no larvæ, at the end of 12 days. The fertility of these eggs was tested in the incubator at a temperature of 19°–21° C., when 100 per cent of them hatched within 48 hours.

It must be borne in mind that the conditions of these tests are strictly artificial, especially in subjecting mosquitoes to ice-cooled air when directly removed from much higher outdoor temperature. Probably a fairer test, simulating natural conditions, would obtain in a gradual fall or rise in temperature. This was indicated in one

experiment where 3 mosquitoes, which had not laid eggs at a temperature of 3°–6.5° C. for one week, were transferred accidentally to another compartment of the refrigerator where the temperature registered 9°–12° C. Six hours elapsed before the misplaced cage was discovered, when it was noticed that about 70 eggs had been deposited. No more eggs were laid when the mosquitoes were returned to the low temperature compartment and the eggs subjected to room temperature did not hatch. This phenomenon might be applied to natural conditions of hibernation in which, during the normal low temperature of winter, a rise of 2.5°–5.5° C. would afford an opportunity for *Anopheles* to oviposit.

The temperatures recorded during the hibernation studies are tabulated as follows:

TABLE NO. II.—*Temperatures and rainfall during January–May, 1915.*

(Recorded at office of Mississippi Delta Planting Co.)

Week.	January.			February.			March.		
	Minimum.	Maximum.	Mean.	Minimum.	Maximum.	Mean.	Minimum.	Maximum.	Mean.
First	−2.5	17.0	6.5	−1.5	15.0	7.0	0.5	17.5	7.0
Second	−2.0	14.0	5.5	0.0	21.0	10.5	2.0	14.0	6.5
Third	−1.5	19.0	6.5	1.5	16.0	10.5	−0.5	18.5	8.5
Fourth	−5.5	17.0	1.5	3.0	20.0	7.0	−3.0	19.5	8.5
Fifth	−1.5	18.0	4.0	.....	.....	.....	1.0	20.5	10.5
Monthly rainfall	3.64			5.56			1.83		
Snow	0.67			.....			.....		

Week.	April.			May.		
	Minimum.	Maximum.	Mean.	Minimum.	Maximum.	Mean.
First	2.0	25.5	12.0	15.5	32.0	23.5
Second	10.0	28.0	20.0	12.0	31.0	19.5
Third	12.0	31.0	20.5	15.5	34.0	25.0
Fourth	15.0	32.0	23.5	18.5	33.5	26.0
Fifth	19.5	34.0	26.0	12.5	29.0	21.0
Monthly rainfall	0.89			5.57		
Snow	.....			.....		

Collateral studies conducted January 3–9, 1916, at Talladega Springs, Ala., a fairly well isolated country town, furnished us with the following information. At this place the investigation was not made primarily for the study of malaria hibernation, but incidental to securing specimens of anophelines for biting experiments. One week was spent at this place, the nature of which differs in one important particular from that of the locality investigated in Mississippi, the presence of commodious, substantially built animal sheds. These places were found to harbor more than 50 per cent of the total number of *Anopheles* collected. This condition has also been observed in other localities in the South by service officers making malaria surveys during the winter months. Possibly the predilection of anophelines for the blood of cattle and horses may exert an influence on the loss of malarial infectivity of these insects

during the overwintering period. A mosquito which may enter upon the hibernating stage in an infective state and which confines its biting to animals housed for the winter may clear its salivary glands of sporozoites before it again bites a human being.

A few notes concerning conditions of hibernation at Talladega Springs were made in the course of collecting specimens during January 3–9, 1916. An examination was made of five streams and one cement reservoir from which numerous anopheline larvæ had been taken in the course of a mosquito survey in September and October, 1915, by Epidemiologist Griffitts of the service. Several *Culex* egg boats and cast puparia were collected, but neither eggs nor larvæ of *Anopheles* were seen. Two trained observers from this locality reported that developed larvæ and pupæ of *Anopheles* were seen in protected streams in November, and as late as the last week of December, 1915.

Specimens of *Anopheles punctipennis* and *quadrimaculatus* were caught, on the first evening of the investigation (Jan. 3) while biting cattle. The temperature at this time was 21° C. General infestation at this place had been seen a few days previously when an unusual rise in temperature had been recorded.

Some idea of at least the maximum temperature during the survey at this place can be gained from the following table:

Table No. III.

Date.	Temperature.	Time of day recorded.	Date.	Temperature.	Time of day recorded.
	° C.			° C.	
Jan. 3, 1916	15.0	5.30 p. m.	Jan. 7, 1916	20.0	7 a. m.
	12.0	8 p. m.		20.0	12 m.
Jan. 4, 1916	8.0	7 a. m.		10.0	8.30 p. m.
	15.0	12 a. m.	Jan. 8, 1916	8.0	7 a. m.
	14.5	8 p. m.		14.0	12 m.
Jan. 5, 1916	13.5	7 a. m.		9.5	6 p. m.
	21.0	7 p. m.	Jan. 9, 1916	7.5	7 a. m.
Jan. 6, 1916	20.5	7 a. m.		13.5	12 m.
	21.0	6 p. m.			

The following table enumerates the distribution of the 392 anophelines collected in this locality, January 3 to 9, 1916:

TABLE No. IV.—*Giving the distribution of Anopheles found in Talladega Springs, Ala.*

Location.	Number of mosquitoes.	
	A. punctipennis.	*A. quadrimaculatus.*
Within dwellings	7	1
Under buildings	27	.....
Mule and horse stables	81	2
Cattle stables	159	.....
Biting cattle in open	6	1
Harness room	4	.....
Feed house	78	.....
Privies	26	.....
Total (392)	388	4

Dissections were made of 371 specimens collected. No organisms resembling *Plasmodium* were found. It is interesting to note in this connection that mosquitoes which have been interrupted in their hiber-

nation can be induced to bite malarial patients and prove efficient hosts for the infective sporozoites. This was indicated in a series of experiments made with some of the specimens collected at Talladega Springs. This occurred six weeks after they were subjected to the artificial conditions of the New Orleans laboratory.

The results of dissecting 2,122 specimens of *Anopheles* in the Mississippi series have been reported in a previous paper. (Mitzmain, 1915.)

A total of 1,211 specimens was dissected previous to May 15, after which time infected mosquitoes in nature were found. It is of course realized that this lot may possibly include individuals of the spring brood, but unless infections are involved it is found convenient to include them. In this connection it is pointed out that the opportunity for receiving the initial infection favors the rejuvenated winter forms, which are the first to secure blood previous to egg laying and the death of the brood.

The 1,211 specimens were distributed as to species as follows:

A. quadrimaculatus, 1,084 specimens.

A. punctipennis, 97 specimens.

A. crucians, 30 specimens.

The remaining mosquitoes dissected during the month of May were used as indicators of the first appearance of the sporogonic cycle of the malaria parasite for this district. These included 902 specimens of *A. quadrimaculatus* and 9 specimens of *A. punctipennis*. None of the latter became infected, but 3 specimens of *A. quadrimaculatus* showed malaria organisms between May 15 and May 26.

It has been previously stated that the occasional sporadic flight and consequent activity of *Anopheles* mosquitoes were witnessed early in the investigation during February 11–14. Upon the first day of the mosquito attacks the maximum temperature had risen 6.5° C.—from 12.5° C. of the previous day to 19° C.—which rise continued for the three following days to a maximum of 21° C.

When men and horses were exposed in the woods the biting appeared general without apparent host preference. House infestation was reported to be unusually severe, although complaints by the plantation negroes were not generally credited. Besides dissecting as many captured specimens as possible, during the intervals of collecting an effort was made to ascertain the pathogenic effect, if any, of the biting of the infesting *Anopheles*. Fifteen persons besides myself complained of the biting of mosquitoes upon this occasion, and the subsequent medical histories of these individuals were accurately followed for a period of four–five weeks. No case of clinical malaria developed in any of these persons; none of them was using quinine in any form. From this time, extending through March and April, four reliable observers, technically trained or col-

lege-bred men, reported occasional attacks of *Anopheles* mosquitoes. They remained clinically and microscopically negative for malaria.

During the four months of the investigation a total of 49 cases of clinical malaria came under personal observation. The blood from 35 of these cases was examined microscopically and definitely determined as to type. Not a single instance of new infection was established, all of the persons affected having been ill during December, 1914–January, 1915, and proved to have relapsed. In several, with severe paroxysms, plasmodial gametocytes were found.

Since it seems fair to assume that hibernating *Anopheles* in this region can be excluded as winter carriers of malaria, we may turn to the consideration of the rôle assumed by man in perpetuating this disease.

It seemed desirable, in making a parallel study of this nature, to include as many human beings as the number of mosquitoes dissected. This I have succeeded in doing by a collection of blood specimens made from persons most likely to have been exposed to the bites of the mosquitoes examined. This index, to be of practical value, had to be completed while mosquitoes were still hibernating and previous to the general flight.

This was done during the months of February and March, 1915. It was aimed to obtain as many blood specimens as practicable from the persons living on plantations and clearings, where the bulk of mosquitoes had also been collected. The majority of the blood specimens were made from colored and white persons while at work clearing timber, burning trees, making ditches, and tilling preparatory to planting the cotton crop. Likewise homes, stores, and offices were visited, in addition to the facilities offered by the company's physicians in obtaining blood smears from patients and visitors.

A total of 1,184 blood specimens was collected from these sources and the character of the persons examined as well as the results are tabulated below:

TABLE NO. V.—*Showing persons examined in February–March, 1915.*

Age (years).	Number examined.					Number infected.				
	White.		Colored.		Total.	White.		Colored.		Total.
	M.	F.	M.	F.		M.	F.	M.	F.	
1 to 3	7	6	12	13	38	8	1	.....	7	16
4 to 5	7	3	15	9	34	2	1	4	3	10
6 to 9	9	7	27	31	74	2	1	21	9	33
10 to 14	8	4	75	60	147	5	.....	41	23	69
15 to 19	6	2	86	46	140	1	1	43	22	67
20 to 29	18	14	135	107	274	9	4	74	43	130
30 to 39	27	19	114	45	205	8	6	42	16	72
40 and over	13	5	170	84	272	7	2	72	14	95
Total	95	60	634	395	1,184	42	16	297	137	492

TABLE NO. VI.—*Summary of results of blood examinations, February-March, 1915.*

Total persons examined		1,184
Positive for malaria		492
Malaria index	per cent	41.55
Omitting mixed cases and one quartan:		
Subtertian (317 cases)	do	64.4
Tertian (166 cases)	do	35.6
Number of gametocyte carriers		122
Subtertian cases with gametocytes		104
Tertian cases with gametocytes		18
Percentage of malarial cases with gametocytes	per cent	24.8
Cases of quartan		1
Cases of mixed infections (excluded in the tertian and subtertian totals)		8

Classification of microscopical findings.

Scanty +, 1 organism per 40 fields and over	258
Few ++, 1 organism per 25 fields	198
Moderate +++, 3–5 organisms per field	34
Numerous ++++, 6–10 organisms per field	1

It will be seen from the summary of results of blood examinations that a sufficient number, nearly one-fourth, of the persons found infected harbored the sexual parasites. Material was thus provided for mosquitoes to carry on the spring cycle of new infections. This state of affairs was no doubt continued uninterruptedly, as it was observed that relatively few of the human carriers were aware of, or were concerned about, their infections.

An insidious condition favoring mosquito transmission thus existed here, as little or no efficient protection against mosquito transmission was provided. Of the total number of infections, namely, 492 persons, only 35 persons were known to develop active symptoms subsequent to taking this index. In addition to these, 14 cases of clinical malaria were reported, but not included in the total infected, as they were not examined by the writer.

The latent character of the infection may be appreciated in the prolonged search for the parasites in many of the blood smears examined. In 456 thick-blood films organisms were scanty or few, and in 258 thick films they were exceedingly scanty, and if corresponding thin films had been examined would doubtless have been found negative.

The parasitological conditions present shortly preceding the time when the mosquitoes sought places for hibernation can best be shown in a malaria index of the persons living in this region during the fall of 1914. The table following shows the results of examinations of 1,666 persons residing in the various plantations in which hibernation studies were conducted. The malaria survey which it rep-

resents was conducted in September, 1914, under the direction of Surg. R. H. von Ezdorf, in charge of malaria investigations of the Public Health Service until his death in September, 1916, and he also personally supervised the microscopical examinations tabulated.

TABLE No. VII.—*Showing persons examined in September, 1914.*

Age.	Number examined.					Number infected.				
	White.		Colored.		Total.	White.		Colored.		Total.
	M.	F.	M.	F.		M.	F.	M.	F.	
Under 1 year	.....	.....	1	2	3	.....	.....	1	.....	1
1 to 3	.....	.....	26	22	48	.....	.....	17	8	25
4 to 5	1	.....	42	37	80	1	.....	18	13	32
6 to 9	.....	1	73	66	140	.....	.....	30	34	64
10 to 14	1	1	119	94	215	1	1	42	30	74
15 to 19	.....	.....	92	86	178	.....	.....	42	35	77
20 to 29	3	1	200	196	400	2	.....	73	85	160
30 to 39	1	1	112	86	200	1	.....	44	44	89
40 and over	1	.....	242	151	394	.....	.....	94	62	156
Not stated	.....	4	.....	3	8	.....	.....	2	2	4
Total	7	8	907	743	1,666	5	1	363	313	682

Summary of results of blood examinations—September, 1914.

Total number of persons examined		1,666
Positive for malaria		682
Malaria index	per cent	40.9
Types:		
Tertian (357 cases)	do	52.3
Subtertian (319 cases)	do	47.7
Mixed cases (6) not considered in the percentage above.		
Number of subtertian gametocyte carriers		86
Percentage of subtertian gametocyte carriers	per cent	26.4

In comparing the data obtained in September, 1914, with those obtained in February and March, 1915, it is evident that the malaria index existing during the winter months remains little altered. It is patent, at least, that recoveries following treatment do not favorably influence the important bearing of the gametocyte carrier. It will be observed that not only is there a relative increase in the number of subtertian gametocyte carriers, but an actual increase, the percentage being raised during latency from 26.4 per cent to 32.8 per cent, and the total number is increased from 86 to 122. It must be observed, however, in this connection, that probably a smaller percentage of the winter carriers harbored suitable numbers of gametocytes to be capable of infecting *Anopheles* mosquitoes.

Of the total number of 1,184 persons examined in February and March, 1915, it is possible to draw certain comparative deductions from a representative group of 103 carriers of all ages distributed among 11 plantations. The persons in this group were selected be-

cause they had been examined previously in September, 1914, and, with few exceptions, had not changed their place of residence. It was found that none of the 103 persons had received specific treatment, so that the recoveries (so far as the microscopical findings can demonstrate) were spontaneous, and the continued presence of parasites could be ascribed either to relapses or to latent infections. In this group 48 cases were found still to harbor the malaria organisms, while the remaining 55 were negative at the time of the reexamination. The positive cases were distributed as follows:

Thirty-three (68.7 per cent) subtertian, of which 14 harbored gametocytes.
Fifteen (31.3 per cent) simple tertian, of which one harbored gametocytes.

It is of interest to note that 8 of the 15 gametocyte carriers were also crescent carriers in September, 1914.

These 15 infected persons, according to the medical records of the plantation health officer, showed no clinical symptoms of the disease during the winter period.

The importance of the public health relation of gametocyte carriers was brought vividly to the attention of the investigator in the discovery of three infected *Anopheles quadrimaculatus* in dwellings which were definitely proved to contain individuals harboring gametocytes. These persons are included amongst the eight infected with gametocytes in September, 1914, and again in March, 1915.

The finding of these infected mosquitoes and the demonstration of the probable human sources of the infection serves to show for this region the intimate relations existing in the perpetuation of the disease through the winter and in linking together the two malarial seasons—autumn and spring.

SUMMARY AND CONCLUSIONS.

The review of the literature on the overwintering of malaria organisms in man and mosquito and on the habits of anophelines during hibernation leads to the impression that the conditions found elsewhere are essentially reproduced in the region investigated in the southern part of the United States.

Hibernation studies during Febuary–June, 1915, were made in territory comprising 15 plantations in Bolivar and Washington Counties, Miss., having a malaria index of over 40 per cent.

Search for hibernating anophelines was conducted in places commonly known or likely to harbor them. The places inspected included residences, outbuildings, animal sheds, cotton houses, swampy and dry woods. Mosquitoes were found to be generally absent from all places except under houses and in the depth of woods. Interiors of dry hollow trees and those with roots in standing water were devoid of resting anophelines. This was ascertained by the aid of electric torches and by sulphur fumigation.

Persistent search for anopheline eggs, larvæ, and pupæ which might have hibernated proved fruitless.

The conclusion is drawn that, in this region in northwestern Mississippi, only the adult female mosquito of *Anopheles* hibernated. Collateral studies made in Alabama gave similar results.

Hibernation data to be of intrinsic value must insure absence of fresh emergences and consider only the presence of the brood known to have emerged prior to the onset of the cold weather. The characteristics of the hibernating mosquito are indicated by the presence of eggs and abundant stored fat cells in the body of the old female, and by the entire absence of male anophelines. It is concluded that the appearance of male anophelines indicates recent emergences, and is interpreted to indicate the arrival of the spring brood.

A control of field observations concerning laying of eggs during winter was provided by laboratory experiments with *Anopheles quadrimaculatus*. These laboratory tests gave the information that, with more than 100 apparently gravid females, egg deposition did not take place at temperatures between 4.5° C. and 12.5° C.

In another laboratory experiment, eggs were laid at temperatures ranging between 13.5° C. and 16.7° C., but these did not hatch except at temperatures above 16° C.; the optimum established being at temperatures between 19° C. and 21° C. These experimental data, applied to conditions found to exist in the region studied, would provide for egg deposition and hatching beginning April 21, when a mean temperature of over 16° C. was sustained. This fits in perfectly with an experimental case in which a hibernating female *Anopheles*, caught April 10, 1915, was induced to bite and laid eggs April 16, which hatched April 21.

Hibernation conditions were observed in January, 1916, in the State of Alabama at a point having the same latitude as Bolivar County, Miss. Probably the conditions found here are more representative for the southern United States. Stables in which cattle and horses were housed for the winter yielded more resting anophelines than elsewhere. A total of 371 specimens of *Anopheles* was collected here and, upon dissection, was found negative for malaria parasites.

It was ascertained, during the course of the winter studies in the region investigated, that occasional biting of roused hibernating *Anopheles* did not have any pathogenic significance, and all of the clinical malarial infections occurring in this region during this period were proved to be recurrences of former attacks.

It was concluded that hibernating anophelines, collected in the region investigated, did not harbor parasites of malaria. This was determined after an examination of 2,122 dissected anophelines, of which 1,211 specimens were examined before May 15, 1915. Among

the remaining 911 specimens, serving as a malaria indicator for the spring season, 3 mosquitoes between May 15 and May 26, were definitely shown to contain oocysts, indistinguishable from those seen in mosquitoes experimentally infected with human malaria.

In the investigation of man as the responsible winter carrier, 1,184 persons, residing on the plantations selected, were examined for malaria parasites. Four hundred and ninety-two infections were identified microscopically; 317 cases were of the subtertian type, 8 were mixed infections, and the remainder were of the simple tertian type, with the exception of one quartan case.

In the consideration of these infections an important fact stands out: *nearly one-fourth (24.8 per cent) of the human carriers harbored gametocytes.*

It was proved that from a group of 103 persons, examined in March, 1915, 8 of the 15 gametocyte carriers identified, were similarly infected during the preceding fall.

The incrimination of man as the sole winter carrier is emphasized by the fact that 3 malaria-infected *Anopheles quadrimaculatus* were found in the homes of these gametocyte carriers during May 15 to May 26, previous to which time 1,180 specimens of *Anopheles* from this source were found to be negative.

ACKNOWLEDGMENT.

The writer wishes to acknowledge his appreciation to the various officials of the Mississippi Delta Planting Co. for the material assistance rendered in the collection of data for this study. Through the kindly services of the general manager, Prof. Fox, and his assistant, Mr. Young, the cooperation of the plantation managers was obtained in securing blood specimens. The temperature chart and the sketch map of the plantations were obtained through the assistance of these gentlemen. Acknowledgment is likewise made to Dr. Miller and Dr. Lane, of the medical staff, for their intelligent cooperation at all times. Thanks are due the chief medical officer, Dr. Miller, for providing generous laboratory facilities and offering personal assistance in collecting mosquitoes and in securing blood specimens.

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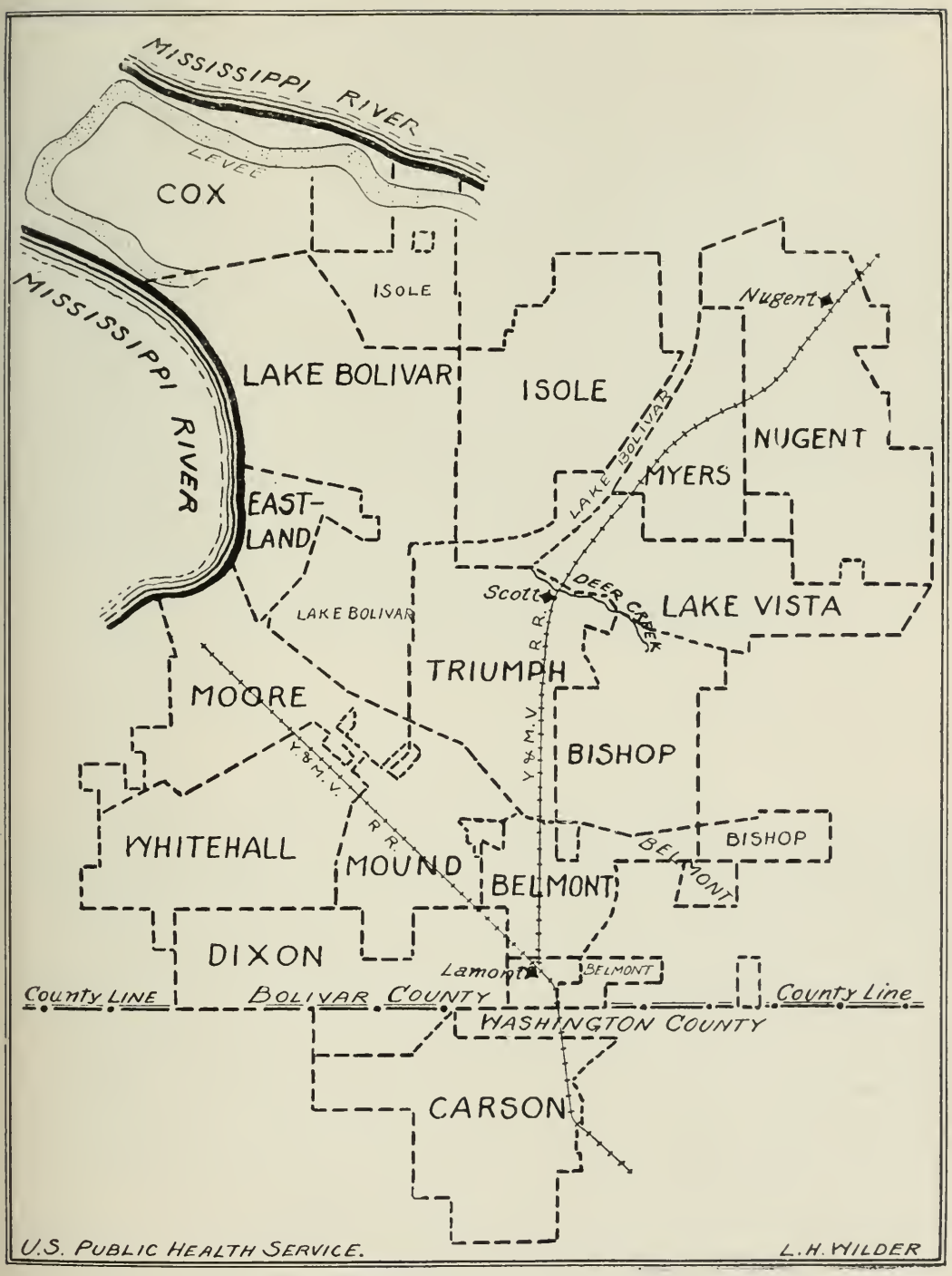
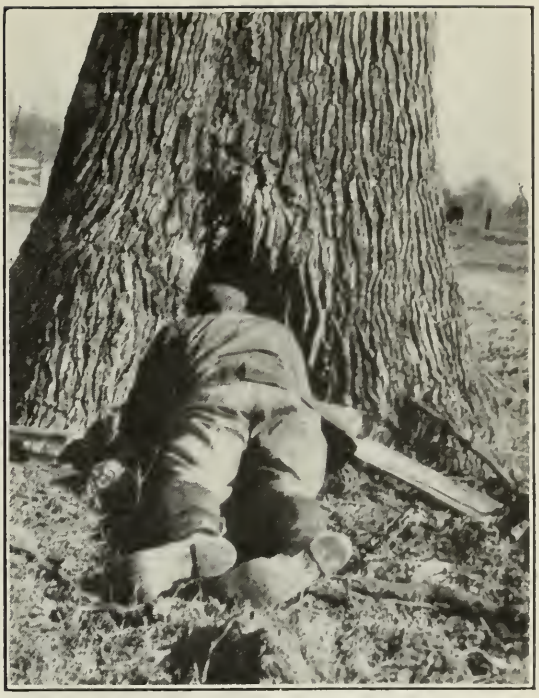


Fig. 1.—Map showing individual plantations of Mississippi Delta Planting Co.

Fig. 2.—Upturned root mass of fallen tree where a few specimens of *A. quadrimaculatus* were found among the exposed root fibers on March 28.

Fig. 3.—Excavation made by falling tree, exposing roots, pool of water beneath. Here in February and March culicines were found in larval and pupal stages and emergences observed. *Anopheles* absent.



Figs. 4 and 5.—Showing method of searching hollows, in standing and fallen timber, for hibernation forms. The tree shown in figure 5 was seen to harbor many *Anopheles* in September, 1914.

Fig. 6.—A hole in a hollow tree receiving sulphur dioxide fumigation.

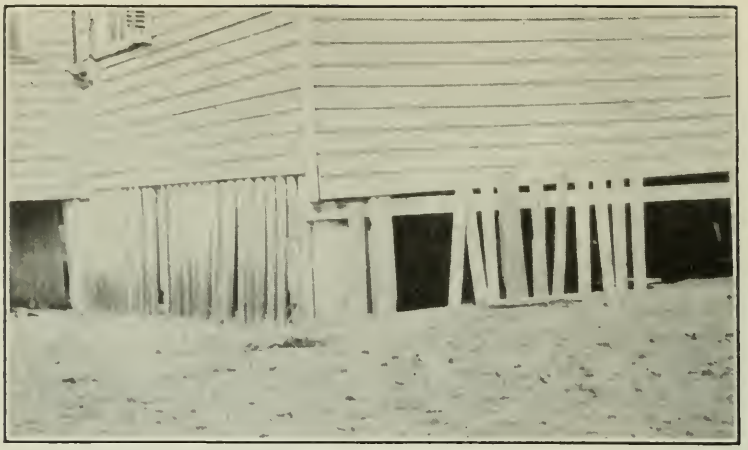


Fig. 7.—Showing understructure of plantation houses, which were found to be fruitful sources of hibernating *Anopheles*.

Fig. 8.—Showing understructure of plantation houses, which were found to be fruitful sources of hibernating *Anopheles*.

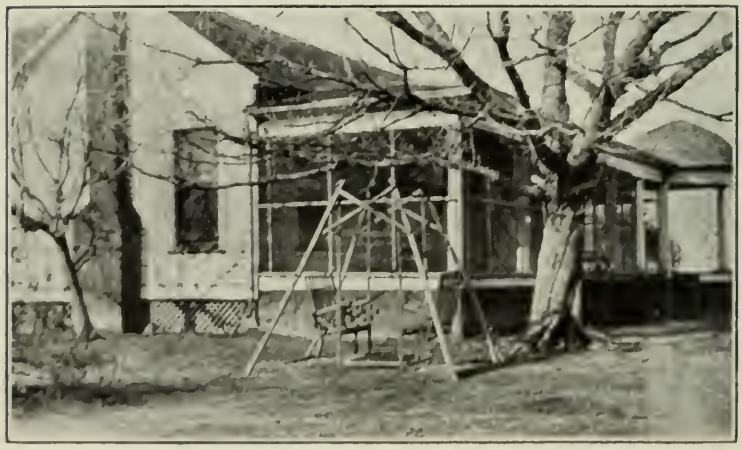


Fig. 9.—Mr. M.'s house, showing means of access by mosquitoes through lattice work and holes in brick understructure. Under this house the first hibernating *Anopheles* were collected during the first week of February.

Fig. 10.—Typical cypress trunk with fissured structure in which leaves found lodgment to serve as possible hiding places for resting anophelines. Such places were not found to shelter mosquitoes.

Fig. 11.—Canvas covered canoe, which remained undisturbed during fall and winter. Shows the ripped canvas in the end of the canoe where several inches of water remained. No mosquitoes of any stage were seen.

Fig. 12.—Showing the method adopted by use of horses as bait to attract anophelines in the woods.

Fig. 13.—An inundated "borrow pit" on Whitehall plantation. *Anopheles* larvae were not found here during February.

Fig. 14.—Junction of Deer Creek and Lake Bolivar where in late fall larvae and pupae of *A. quadrimaculatus* were found. Seven persons among the fishing women on the bridge proved to be winter carriers of *Plasmodium*.

Fig. 15.—Group of negro tenants on Lake Vista plantation. No case of sickness reported here, yet 43 per cent were carriers of malaria during February and March.

Fig. 16.—Group of tenants on Myers plantation. Fifty per cent were infected with malaria during February and March. No clinical case observed. The head of the family proved to be a gamete carrier.

Fig. 17.—Showing apparently healthy negro tenants of Mound plantation engaged in clearing operations. Five of the eight men in this picture were winter carriers of malaria; two of these harbored gametocytes.

Fig. 18.—Photomicrograph of a stained preparation showing young oocysts on the stomach of an *A. quadrimaculatus* dissected May 15, 1915. This represents the initial infection of the spring season.

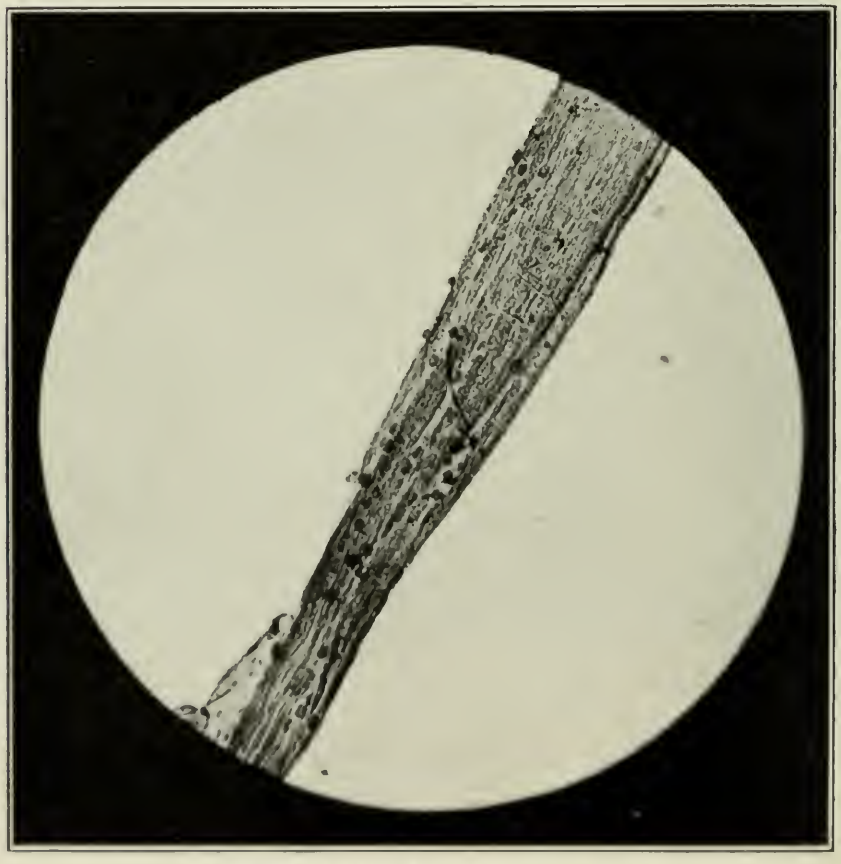


Fig. 19.—Enlarged view of portion of Fig. 18.

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UNITED STATES PUBLIC HEALTH SERVICE

PUBLIC HEALTH BULLETIN No. 85
JANUARY, 1917

MINERS' CONSUMPTION

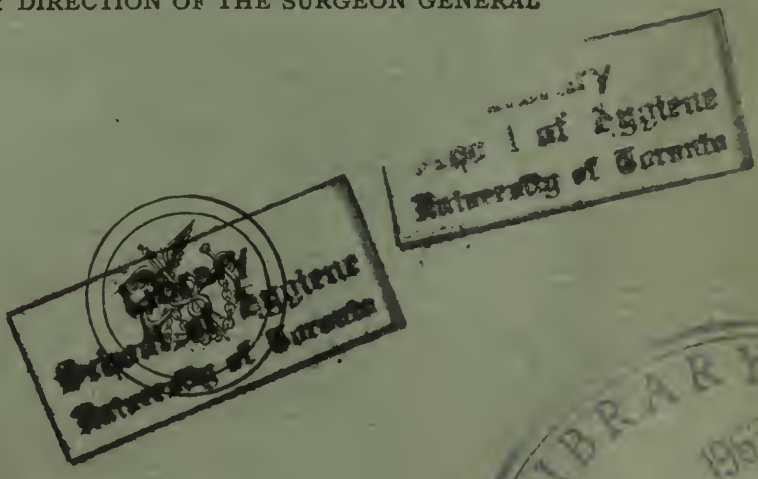
A STUDY OF 433 CASES OF THE DISEASE AMONG ZINC MINERS IN SOUTHWESTERN MISSOURI

By A. J. LANZA
Passed Assistant Surgeon, United States Public Health Service

WITH A CHAPTER ON ROENTGEN RAY FINDINGS IN MINERS' CONSUMPTION

By Dr. SAMUEL B. CHILDS

PREPARED BY DIRECTION OF THE SURGEON GENERAL



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MINERS' CONSUMPTION.

A STUDY OF 433 CASES OF THE DISEASE AMONG ZINC MINERS IN SOUTHWESTERN MISSOURI.

By A. J. Lanza, Passed Assistant Surgeon, United States Public Health Service.

The following paper is based upon a study of 433 cases of miners' consumption.

That there is an unusual amount of tuberculosis among the sheet-ground miners in southwestern Missouri has been a matter of common knowledge in that part of the country for some years, this condition of affairs being generally ascribed to exposure to the flinty rock dust caused by drilling and other underground operations. The Jasper County Antituberculosis Association was organized, and in 1914 this society, through its secretary, Miss Hackett, petitioned the Surgeon General of the Public Health Service for assistance. As the Public Health Service was cooperating with the United States Bureau of Mines in studies of miners' diseases and mine sanitation, the Joplin district was deemed a favorable field for investigation, and the writer, together with Mr. Higgins, mining engineer of the Bureau of Mines, was sent there to investigate and report on the prevalence, causes, and methods of control of pulmonary disease among the miners. The results of these studies were reported in a bulletin published by the Bureau of Mines.[1] Advantage was taken of this cooperation to carry on a more detailed study of silicosis (miners' consumption), with special reference to physical signs, intercurrent affections, family incidence, and Roentgen-ray findings.

Physical examinations of a large number of miners were deemed necessary. Accordingly it was advertised throughout the district that any bona fide miner would be examined without charge at the office of the Public Health Service in Webb City, Mo. At every opportunity miners were urged to come, whether they felt sick or well, whether or not they had any apprehension as to their physical condition. As a result 720 miners presented themselves and were

[1] Technical Paper 105. Pulmonary Disease Among Miners in the Joplin District, Mo., and its Relation to Rock Dust in the Mines. A preliminary report by A. J. Lanza and Edwin Higgins. 1915.

examined, without any selection and regardless of their symptoms. Naturally, however, most men came because dyspnea or a cough gave them reason to suspect that they had lung trouble.

The writer takes this occasion to express his thanks and sincere appreciation to those who so generously contributed their assistance; particularly to Dr. Childs, of Denver, who contributes the chapter on the Roentgen-ray findings, and who interpreted the series of X-ray plates; to Dr. Dumbauld, of Webb City, Mo., who took the X-ray plates; to Miss Sieber, of Joplin; to Miss Hackett, of Carterville, Mo.; to Dr. Gelien, of Denver; to the Missouri State mine inspectors; and to the physicians and mine operators of Jasper County, Mo.

HISTORY OF DISEASE.

Miners' consumption has been recognized for a number of years as the most important health hazard of the metal mining industry, and as one probably widespread throughout our mining districts, but until this investigation it had never been the subject of State or Federal inquiry in this country. Other countries have devoted considerable attention to this subject, however, and the report of the Miners' Phthisis Committee, Union of South Africa, Cape Town, 1912, states (p. 5): "It has long been known that miners engaged in metalliferous mining in hard rock are prone to suffer to a greater extent than do the general population from chronic lung disease. But it has been especially during the past 15 or 20 years, a period which coincides broadly with the time during which rock drills have come into general and increasing use in mining operations, that this excessive incidence of lung disease has attracted serious attention in the larger mining centers of the British Empire, and has in almost every important mining area been the subject of official investigation."

The first commission to inquire into miners' phthisis was appointed in the Transvaal in 1902. A number of reports of various Government commissions in South Africa have appeared since then. In 1904 the health of Cornish miners was the subject of an official report. In Australia in 1905, 1907, and 1910 there were issued similar reports. To these investigations of miners' diseases in various parts of the British Empire we are indebted for arousing interest and perhaps apprehension as to our own mining health hazards. Miners and mining officials of this country have long been cognizant of the pulmonary disease incident to metal mining in hard rock: "miners' consumption" is the term that has come into general use here as "miners' phthisis" has in South Africa, and the miners themselves have always distinguished this form of consumption from the "old-fashioned" or "catching" kind. The miners have also recognized

the relationship between miners' consumption and rock dust, and while they have many local notions on the subject, in the main their ideas are fairly correct; thus in some of the Rocky Mountain mining camps a particularly dusty type of machine drill is popularly known as the "widow maker."

But while the miner—employer and employee—has appreciated with a fair amount of accuracy the dangers to health to which his occupation exposed him, very little has resulted from that knowledge in the way of prevention. In the Joplin district, it is true, strenuous efforts are being made to overcome rock dust, but these efforts are of comparatively recent origin. However, the miner, naturally accustomed to a life of risk, has not been more backward in improving his working conditions than has the lead worker, the phosphorus worker, or other worker at dangerous or hazardous trades. In all, improvement has been accomplished largely from without, often at the protest, frequently with the resistance of those most concerned. Only, in the case of the metal miner, his health hazards have not received the attention that has been focussed on the others and consequently objectionable conditions have persisted for a longer time.

WORKING CONDITIONS.[1]

The Joplin mines are zinc and lead mines. Certain of them, known as "sheet-ground" mines, consist of large connected chambers or rooms, 150 to 200 feet underground; the zinc ore is found embedded in flint which lies in horizontal layers or sheets; hence the name. Mining operations, drilling, blasting, etc., are therefore done in flint, an exceedingly hard rock with a silica content of over 95 per cent. This flint forms a very fine, hard, sharp, and insoluble dust, which permeates the underground atmosphere to a varying extent and which, naturally, is extremely irritating to the lungs when inhaled, causing the condition known as miners' consumption.

The bulk of the underground workers are composed of machine-drill operators, their helpers, and shovelers who shovel the ore into the containers in which it is hoisted to the surface. In the Joplin mines both classes of miners are about equally exposed to dust, and it was impracticable to differentiate between these types of work in their relation to the incidence of miners' consumption. The shovelers work very hard, more so than the machine men, their work often helping to break down their health. Men who work on the surface may contract miners' consumption. The hoisterman may inhale rock

[1] For a detailed description of working conditions in the mines of the Joplin district, also for methods of securing dust and air samples underground, the reader is referred to Technical Paper 105 and Bulletin No. 132, United States Bureau of Mines, entitled "Pulmonary disease among miners of the Joplin district, Missouri, and its relation to rock dust in the mines," preliminary and final reports.

dust when the ore is dumped after being hoisted out of the mine; in the mills where the ore is crushed, the rock dust may be present in sufficient quantity to imperil the health of the millmen.

There are no other important health hazards in the Joplin mines, the ventilation being usually good and the working temperature favorable, while powder fumes are not usually present in sufficient degree to be a factor in disease production.

NATURE AND CLINICAL DESCRIPTION OF MINERS' CONSUMPTION.

With flint dust as the etiological factor, we have in miners' consumption a pneumonoconiosis, which, being due to silicious dust, is properly termed "a silicosis." While the latter name is correct, the term "miners' consumption" has been so widely accepted in this country that it seems best to retain it, especially as it is in itself descriptive of an occupational disease.

As in other dust diseases, the result of the inhalation of hard rock dust is a fibrosis, with perhaps actual destruction of the alveolar cells by direct action of the dust; a gradual loss of function, evidenced by a continually increasing dyspnea on exertion, is produced by this entirely mechanical condition. As Thompson[1] states:

> The morbid process is a chronic interstitial inflammation of the lungs usually most intense at the apices, but to a considerable extent found elsewhere. The lung is pervaded with minute nodules, so that the freshly cut surface feels rough and grates upon the knife. Within the nodules are permanently imbedded the irritating particles. The bronchial and mediastinal glands are similarly filled with the disseminated particles which have been conveyed to them by the leucocytes.

It is not intended to pursue further the pathology of miners' consumption at this time, but rather to consider the disease in its clinical aspects.

The condition of silicious dust fibrosis, once established, may persist until complete incapacity for work and death from some intercurrent malady occur, or the silicosis may be complicated by a tubercle or pyogenic infection.[2]

As would be expected, the chief symptom of miners' consumption is dyspnea on exertion. The dyspnea comes on gradually, sometimes preceded by a bronchitis, more often not. As the fibrosis advances, the dyspnea increases in severity until it becomes urgent and disabling. It is conspicuous in the clinical picture because it so completely overshadows the other symptoms. The majority of the patients examined in this investigation looked well, even with severe dyspnea, and aside from this complaint many of them felt well.

[1] The Occupational Diseases, W. Gilman Thompson, M. D.

[2] See relationship of miners' consumption to tuberculosis below.

They were mostly big, robust men and, even when suffering from a considerable disability, showed nothing in their appearance to indicate the fact. As their dyspnea increased from year to year, they would notice a falling off in the amount of work they could do; especially was this the case with the shovelers, who, working by the piece, usually kept a record of their work. The dyspnea was evident on exertion only. In early cases it was not so noticeable after the men had gotten "warmed up," and it was not uncommon to have them say that their wind was better underground than on the surface. Throughout the series of cases quoted later there was no evidence that the dyspnea was due to vesicular emphysema or any condition of the lungs other than fibrosis (except complications seen in terminal stages). All cases in which the dyspnea could be attributed, either in whole or in part, to cardiac or other nonpulmonary affections were classed as "doubtful" or "miscellaneous," and are not included in the series "Miners' consumption."

Pain in the chest usually appears early and persists throughout, though often appearing to remit in the terminal stages. At first these pains are apt to be varied in location, now in one part of the chest and now in another. Later on they remain for a considerable time in one place. Their intensity varies, being most often moderately severe and usually unaccompanied by any pleural rub or other physical sign which would define them. In the beginning patients are most apt to complain of pain over the front of the chest, on both sides, especially the upper half. This pain is probably due to the irritation of the finer bronchial passages, as evidenced by the peribronchial thickening seen in the X-ray plates of early cases.

Diminished expansion was complained of by the majority of patients—that is to say, the inability to draw a deep breath was sufficiently marked to be a basis for complaint when their histories were taken, even in the early cases. In those with a well-developed fibrosis the inability to draw a deep breath was striking, all the inspiratory muscles being brought into play in the effort. If we can imagine a man with his chest bound around with transparent adhesive plaster, we can form a mental picture of how useless were the efforts at deep inhalation made by these patients.

Loss of weight was a constant symptom. Like the dyspnea, it came on gradually, but was rarely of any considerable extent until the patient was in a far-advanced condition.

Cough occasionally antedated dyspnea; in some cases there was an initial bronchitis that ushered in the fibrosis, but this was uncommon. Usually cough did not appear until the dyspnea was noticeable, though both symptoms may appear simultaneously. Cough was apt to be severe at night and in the morning. Many patients

complained of vomiting their breakfast; and when this occurred with more or less regularity the miners were accustomed to do without their breakfast, taking their first meal at noon. Apparently, if they did not eat they did not cough, and it is possible that this after-breakfast vomiting may not be due entirely to a cough of pulmonary origin but also to direct irritation of the gastro-intestinal tract by ingested dust. This explanation, while in accord with the experiments of Vilaret, Calmette, and others, is offered here purely as a suggestion. Occasionally patients were seen who had no cough, and cough was also frequently increased in severity at varying periods, due to "colds," bronchitis, and similar disturbances of the respiratory tract to which this class of patients are very subject. Most generally the cough was in proportion to the amount of sputum and, when present to a marked extent, was indicative of infection.

Hemorrhages were rather frequent, becoming more so as the silicosis advanced. Thus, in this series, 3.3 per cent of those in the first stage had hemorrhages; in the second stage, 10.5 per cent; in the third stage, 20.5 per cent of the uncomplicated cases and 30 per cent of those with an added tubercle infection.

Night sweats were uncommon. When present they denoted an infection, either tuberculous or pyogenic; but many cases with such infections had no night sweats, and their value for diagnosis was a positive one only.

The blood-pressure records gave little information. As in other chronic diseases, the downward progress of the patient was accompanied by a gradual fall in the blood pressure; there was no elevation observable in the early cases, and there was a noticeable diminution in cases complicated with an infection as compared with the noninfected ones in the same stage.

The sputum varied in amount from nothing to a large quantity, depending on the presence of tuberculous or pyogenic infection and, to some extent in the early cases, of bronchitis. In the later stages, with breaking down of lung tissue, the sputum was very characteristic, in fact diagnostic, being of a marked slaty blue color and of a very tenacious consistency. This color is due to the presence of flint dust, previously inhaled and embedded in the lung tissues. In doubtful cases the appearance of this sputum is sufficient to determine a diagnosis.

In slide preparations of the sputum, made in the usual manner, the flint dust could be readily seen. A number of these slides were sent to the Pittsburgh laboratory of the Bureau of Mines and examined by Dr. Reinhardt Thiessen, who reported, in part, as follows:

> The sputum preparations were examined by both oil immersion objective with ordinary illumination and the paraboloid or ultra condenser. * * * All the preparations contained a considerable amount of rock-dust particles. * * * The rock dust is of the same nature and appearance as that

gathered on slides by Mr. Higgins in his rock-dust sampling experiments. It is the dust of chert,[1] but what minerals are present it is impossible to say. * * * The sizes of the particles are also approximately the same as those in the proparations of mine-dust samples, but the larger particles are fewer in number. There are comparatively few particles measuring over 10 microns in diameter, but a large number measure between 2 to 5 microns, with rapidly increasing numbers of smaller sizes down to particles of colloidal dimensions. * * * Slide 27 contains the most rock dust.

Attention is particularly called to the statements of the sizes of the rock dust particles. This agrees with the results of investigations as stated by Dr. Moir:[2]

In examining the lungs of victims of miners' phthisis it has been found that the diameter of quartz particles that lodged permanently in or on the tissues averaged less than 3 microns, that very few were above 8 or 10 microns, and none were greater than 12 microns.

All samples of sputum were examined in a uniform manner. The sputum was first digested with a mixture consisting of double strength Labarraque's solution, to which was added 7½ per cent sodium hydrate; one part of this solvent was added to five parts of sputum, and let stand until the sputum was about the consistency of water, a little chloroform and alcohol solution was then added, and the whole centrifuged.[3] All of the resulting sediment from each sample was smeared and examined for tubercle bacilli.

Physical examination was frequently disappointing and generally unsatisfactory in that the physical signs were so inadequate apparently to account for the symptoms. Even in cases with well-marked dyspnea it was not uncommon to find practically nothing on examination. This was true in all but the far-advanced cases.

Percussion was inconclusive in all but advanced cases. Most of the men were very muscular, especially around the shoulders and upper part of the chest.

The most constant sign was weakened breath sounds. Weakened breath sounds were most frequently noticed in the upper half of the chest, and in earlier cases could often be detected behind sooner than in front. As the fibrosis progresses the breath sounds become weaker and weaker, at times being entirely inaudible in parts of the chest. In the far-advanced cases, however, with considerable breaking down of tissue and riddling of the lungs, the breath sounds are harsh and exaggerated; also it was in these cases only that prolongation of expiration was observed. A number of times it was noted that portions of the chest would be entirely free from breath sounds, but that on examination some time later breath sounds would be audible over the same area. This was probably due to a mechanical blocking off of a portion of the lung, which seems likely in view of the

[1] Chert—impure flinty rock, including the jaspers. Dana, Textbook of Mineralogy.
[2] Journal Chemical, Metallurgical and Mining Society of South Africa, August, 1915.
[3] Practical Bacteriology, Stitt.

fact that pulmonary abscesses are fairly frequent in miners' consumption.

Diminished vocal resonance was not infrequently noticed over areas of weakened breath sounds.

Moist râles were almost never present in early cases, and in those more advanced were usually accompanied by a variety of adventitious sounds. Moist râles following cough, and unobscured by other sounds, as commonly heard in ordinary pulmonary tuberculosis, were hardly ever observed in these cases of silicosis. Sibilant râles and a sound suggestive of a friction rub, but distinct from it, were among the adventitious sounds most frequently heard. Moist râles, while usually indicating an infection, had, like night sweats, only a positive value; many cases with a considerable amount of sputum, with and without tubercle bacilli, had no moist râles. In some of the advanced cases the variety and extent of the adventitious sounds just mentioned were truly remarkable.

To summarize, aside from the distinguishing feature of a progressive dyspnea on exertion, there is little of constant value in either symptoms or signs. For diagnosis, the most important symptoms are dyspnea, associated with pain in the chest and diminished expansion; when these are present in a miner with a history of exposure to rock dust, the diagnosis of miners' consumption declares itself, even though the patient may be the picture of robust health. While slaty blue sputum, when present, is diagnostic, yet the physical examination of the patient is, in itself, insufficient without a knowledge and consideration of the occupation.

CLASSIFICATION OF CASES—RELATIONSHIP OF MINERS' CONSUMPTION TO TUBERCULOSIS.

For convenience, the writer has divided miners' consumption into three stages.[1]

The first stage is characterized by little or no disability, with slight or moderate dyspnea on exertion; the second stage by noticeable disability, with moderate or moderately severe dyspnea; the third stage by total, or at least marked, disability, with severe or urgent dyspnea. This is an entirely arbitrary classification, but one which the writer believes has a considerable practical utility. The inconclusiveness of physical signs made impossible a classification on the basis of actual involvement; also, a classification such as the above is logical in dealing with an occupational disease, where actual disability will ultimately be the basis of relief under laws of compensation and health insurance.

[1] The Miners' Phthisis Commission of South Africa divided victims of that disease into four classes.

Patients in each of the three stages have been further subdivided into tuberculous and nontuberculous. This division is based entirely on the presence or absence of tubercle bacilli in the sputum. Neither symptoms nor signs could be relied on to prove or disprove a tuberculous infection in all cases. Many with tubercle bacilli in their sputum had none of the clinical symptoms of tuberculosis; others with moist râles had no bacilli and no afternoon elevation of temperature.[1]

In this series infection was uncommon in the first stage, frequent in the second stage, and still more so in the third; as the miners' consumption progresses the likelihood of both tubercle and pus infection increases, and it has been the writer's experience that practically no cases die without tubercle bacilli being present in the sputum. Tubercle infection is often a terminal phenomenon of other diseases, but even so its almost constant presence in advanced cases of miners' consumption invests this disease with an additional importance as concerns the public health.

Miners' consumption as observed in southwestern Missouri does not resemble, clinically, ordinary pulmonary tuberculosis; even when tubercle bacilli are present in the sputum, the lack of resemblance is plain and persists until the last few days of life, when, the patient being practically moribund, the resemblance to tuberculosis is more apparent. Some of the symptoms and signs common to tuberculosis are frequently present, yet their proportion when weighed against one another, the patient's appearance, and the large amount of work he is doing prevent us from concluding that the disability, at whatever stage it may be, is largely the result of a tuberculous infection. Throughout there is too much dyspnea to be due to a tubercle infection and still permit the patient, though free from other symptoms, to do a hard day's work; also, were the dyspnea, cough, and sputum due to a tubercle infection, we would expect a rise of temperature in the afternoon, but a temperature record of such cases, still working, failed to show any elevation. The result of roentgenograms is set forth separately.

Usually a tubercle infection implies a more rapid downward progress, an almost hopeless prognosis. It is possible that, up to a certain point, the dust fibrosis may hinder or retard the activity of the tubercle bacillus until a pyogenic infection, or an anemic necrosis, by breaking down the lung tissue, furnishes the tubercle bacillus a more favorable opportunity for development. Occasionally there was observed a patient with evidence of silicosis who also had tubercle bacilli in his sputum and who, nevertheless, looked well and felt well and was able to work on from month to month without any noticeable progress of his disease. Such cases were uncommon; usually

[1] See discussion of tubercle infection below.

once a tuberculous infection is established, or activated, its progress is rapid and its advent signaled by a sudden increase in the severity of the symptoms. Sometimes a tubercle infection will run an acute course; the aggravation of symptoms will be marked; disability will be sudden; and death will ensue in the course of a few weeks or months.

Tuberculosis may be grafted on a miners' consumption either as the result of a direct action of hard rock dust on a previously quiescent tuberculous focus, or by infection from without, the latter being favored by the unusual soil prepared for it. But in any event, the activation of tubercle once accomplished, both local and general constitutional conditions favor speedy development. In other words, looking at the matter from the viewpoint of the generally accepted (international) classification of pulmonary tuberculosis, there is no such thing as the first stage in these cases; when tubercle activity is established the patient is immediately in the far-advanced, or at least moderately advanced, stage. The period of incipiency, if such a phrase is permissible, so often prolonged in ordinary pulmonary tuberculosis, thus becomes a negligible quantity when tubercle infection is grafted on a silicosis. This fact, by reducing the margin of error, tends to make acceptable the classification of tuberculous or nontuberculous by the presence or absence of tubercle bacilli in the sputum.

However, this consideration, while helping to illuminate the status of tubercle infection in miners' consumption, should not allow such infection to overshadow the importance of rock dust. Tubercle infection is secondary in producing disability, though it may hasten death, the silicosis being the primary factor and sufficient to produce these results without the aid of infection.

TABULATION OF RESULTS OF PHYSICAL EXAMINATIONS.

There were 720 miners examined; of these 433 had miners' consumption, 103 also having tubercle bacilli in their sputum. There were 43 cases in which the diagnosis was doubtful, 26 who were suffering from miscellaneous nonpulmonary diseases, and 39 who had an uncomplicated tuberculosis. None of these last three groups are included in the above.

MINERS' CONSUMPTION, FIRST STAGE.[1]

Number of patients, 120; average age, 31; married, 84; single, 36.

AGES, BY 10-YEAR GROUPS.

Under 20	2	40 to 49	10
20 to 29	54	50 to 59	7
30 to 39	48		

[1] In each stage the nontuberculous group is tabulated first, then the tuberculous.

AGES UNDER 21, AT WHICH MINING COMMENCED.

At 12 years	2	At 18 years	6
At 13 years	8	At 19 years	9
At 14 years	2	At 20 years	16
At 15 years	6		
At 16 years	7	Total (57.5 per cent)	69
At 17 years	13		

The remainder commenced mining when over 20 years of age. In this and similar tables ages under 16 usually indicate miners who began their underground work in coal mines.

The average number of years that the men in this group had worked underground (at all kinds of mining, including coal) was 10, while the average number of years' work in sheet-ground (hard rock) was, for 88 men, 5.3 years. Sixteen men had been working in the sheet-ground mines of Jasper County less than a year; of these, 5 had silicosis and 6 anthracosis on arrival, contracted in other mining camps.[1] Six men showed symptoms of rock-dust injury to the lungs, with a history of less than one year's exposure. Fifty-one men averaged 4.5 years on machine drills and 47 men 3.4 years shoveling. One man contracted miners' consumption during 25 years of millwork from exposure to dust set free by the crushers.

Of the 120 men, 115 appeared healthy and 5 looked sick. Following is a tabulation of the various symptoms of the group:

Diminished expansion (noticeable to patient)		40
Loss of weight		25
Hemorrhages (3.3 per cent)		4
Night sweats		2
Pain in chest		79
Front upper half, one side	1	
Front upper half, two sides	9	
Back, lower half, one side	6	
Back, lower half, two sides	7	
Front and back, one side	16	
Various	40	

All of the group had dyspnea on exertion, either mild or moderate in degree. The relationship of dyspnea to cough is shown in the following table:

Dyspnea without cough	29
Dyspnea occurring before cough	48
Dyspnea beginning at same time as cough	11
Cough occurring before dyspnea	8
Doubtful	19

[1] In this investigation the migration of miners was a negligible factor. In most mining camps there is a considerable annual migration, but in the Joplin district the miners are natives and previous to 1915 outsiders had not come in in any large number. The mining other than sheet-ground in these tables was usually "soft-ground" mining in the same district and in southeastern Missouri.

The duration of dyspnea previous to examination was—

1 month	5	1½ years	1
2 months	4	2 years	15
3 months	5	3 years	20
5 months	1	4 years	5
6 months	10	5 years	6
8 months	1	8 years	1
1 year	22	Doubtful	19

Attention is called to the fact that in only 8 cases was there a history of cough antedating dyspnea; also to the wide variation in the previous duration of dyspnea. The only information on the subject was that obtained by questioning the patient; and as the average laboring man is not apt to pay much attention to symptoms until they are fairly troublesome, it is probable that the actual duration of dyspnea was usually longer than recorded. This last table is given mostly as a matter of interest; the duration of symptoms previous to examination, based on the statements of the patients themselves, is too inaccurate to be valuable for statistics. Rather must the stage of miners' consumption and the degree of disability be contrasted with the number of years' exposure to rock dust to establish the duration of the silicosis.[1]

The amount of sputum was considerable in 14 cases, moderate in 12, and little or none for the other 94.

The blood pressures for the group averaged 93–122, taken by the auscultatory method. The following abnormalities were noted:

High systolic pressure, 150 or over	2
Low systolic pressure, 100 or less	5
High diastolic pressure, 110 or over	10
Low pulse pressure, 20 or less	11

There are 8 duplicates in the above, making a total of 20 abnormal blood pressures. Nothing observed in these blood-pressure records could be considered as diagnostic for the group.

Of the 120, 81 had no appreciable physical signs on examination. Weakened breath sounds were noted in 35, as follows:

Over all	7
Over all, more marked one side	2
Over one side	6
Over one side and half of other	2
Over all behind	5
Over one side behind	1
Over upper half, one side	5
Over upper half, one side behind	4
Over one base	3

Dry, sonorous râles were noted in 5 and moist râles in one. The paucity of physical signs in this group is apparent. One hundred

[1] See table, Analysis of deaths.

and eighteen of the 120 were working at the time of examination or until some time within the previous six months.

There were 8 miners in the first stage of miners' consumption with tubercle bacilli in their sputum, not enough for a satisfactory comparison with the nontuberculous group. The average age for the 8 was 28, and all but 1 were married.

AGES BY 10-YEAR GROUPS.

20 to 29	5
30 to 39	2
40 to 49	1

AGES, UNDER 21, AT WHICH MINING COMMENCED.

At 13 years	1	At 17 years	1
At 15 years	1	At 19 years	1
At 16 years	1	Total (62.5 per cent)	5

The average number of years these men had been mining was 7.7 and the average for sheet-ground (hard rock) mining was 4.6 years. Four men had averaged 3.2 years on machine drills and three had averaged 2.6 years shoveling; one man had worked less than a year in sheet-ground.

All of the eight looked healthy; their symptoms were as follows:

Diminished expansion	4
Loss of weight	0
Hemorrhages	0
Nightsweats	0
Pain in chest	4

Cough was absent in four and the duration of their dyspnea was—

3 weeks	1
9 months	1
2 years	2
3 years	2
Doubtful	2

The amount of sputum was moderate in one and very little in the other seven.

The blood pressures for the group averaged 90–117, with the following abnormalities:

High systolic pressure, over 150	1
Low systolic pressure, less than 100	1
Low pulse pressure, less than 20	1

Of the eight, three had no physical signs on examination, four presented weakened breath sounds, with diminished vocal resonance in one case, and one had moderate moist râles at an apex.

All were working at the time of examination and said they felt well. Comparison between the two groups does not give much in-

formation except that the difference in the blood pressure, 5 points lower for the tuberculous group, is suggestive. Contrasting these eight cases with what we would expect to find in a similar number with ordinary pulmonary tuberculosis having tubercle bacilli in their sputum and an evident dyspnea, the difference between the two types of tubercle infection is apparent. None of these eight had evidence of mixed infection, which probably accounts for their apparently good condition aside from dyspnea.

MINERS' CONSUMPTION, SECOND STAGE.

Number of patients, 142; average age, 32.7; married, 112; single, 30.

AGES BY 10-YEAR GROUPS.

20 to 29	55
30 to 39	63
40 to 49	18
50 to 59	5

AGES, UNDER 21, AT WHICH MINING COMMENCED.

At 10 years	1	At 17 years	6
At 12 years	4	At 18 years	6
At 13 years	2	At 19 years	11
At 14 years	6	At 20 years	12
At 15 years	16		
At 16 years	15	Total (55.6 per cent)	79

The average number of years that the men of this group had worked underground was 11.6. One hundred and thirty men averaged 6.7 years in the sheet ground, 9 had worked in sheet ground less than a year, 1 had done only hoisting, and 2 had done only millwork. Seventy-eight men averaged 4.3 years on machine drills, and 71 averaged 4.1 years shoveling.

Of the 142 in the second stage, 5 looked sick and the rest appeared healthy. Their symptoms are tabulated as follows:

Diminished expansion		93
Loss of weight		86
Hemorrhages (10.5 per cent)		15
Night sweats		18
Occasional	14	
Frequent	4	
Dubious history of former night sweats		18
Pain in chest		111
Over all	2	
Over all behind	1	
Over one side	25	
Over both bases	5	
Over one base	9	
Various	69	

Cough was absent in 10, occasional in 48, the remainder having more or less constant morning and evening cough; in 10 cases cough antedated dyspnea. The duration of their dyspnea, which varied from moderate to moderately severe, was—

3 weeks	1	2 years	28
1 month	1	3 years	16
3 months	7	4 years	7
4 months	3	5 years	10
5 months	3	6 years	3
6 months	10	7 years	1
7 months	1	8 years	2
8 months	1	10 years	3
9 months	2	Doubtful	17
1 year	26		

The amount of sputum was moderate in 37, considerable in 35, and little or none in the remaining 70.

The blood pressure in 132 cases averaged 91–118, four points lower than in the first stage. Abnormalities were noted as follows:

High systolic pressure, 150 or over	1
Low systolic pressure, 100 or less	8
High diastolic pressure, 110 or over	11
Low pulse pressure, 20 or less	4
	24

Of the 142, 36 had no appreciable physical signs. Weakened breath sounds were present in 66, as follows:

Over all	32
Over one side	11
Over upper half, both sides	3
Over upper half, one side	2
Over all behind	9
Over both bases	5
Over one base	5
Over apices	1

Nine presented diminished vocal resonance, in seven instances over areas of weakened breath sounds. Although 72 had a moderate or a considerable amount of sputum, moist râles were present in only 16, as follows:

Over all	1
Over one side	1
Over upper half	7
Over lower half	7

Dry râles of various types were present in 14.

Of these 142 men, 133 were working at the time of examination or until within the previous six months.

There were 22 miners in the second stage who also had tubercle bacilli in their sputum. The average age was 31.3; 17 were married and 5 were single.

AGES BY 10-YEAR GROUPS.

Under 20	1
20 to 29	13
30 to 39	4
40 to 49	3
50 to 59	1

AGES, UNDER 21, AT WHICH MINING COMMENCED.

At 11 years	1	At 18 years	3
At 13 years	1	At 19 years	3
At 15 years	1	At 20 years	1
At 16 years	1		
At 17 years	2	Total (59 per cent)	13

The average number of years the men in this group had been mining was 11.4, 20 men had averaged 5.6 years in sheet-ground, and 2 had worked in sheet-ground less than 1 year. On machine drills in sheet-ground 13 men averaged 4.6 years, while 9 men shoveling averaged 3.3 years.

Of the 22 only 1 looked sick; their symptoms were:

Diminished expansion		16
Loss of weight		10
Hemorrhages		1
Nightsweats		1
Pain in chest		15
Over front	2	
Over one side	5	
Over one base	3	
Various	5	

Cough was absent in 1, and in 5 preceded dyspnea. The duration of dyspnea was—

2 weeks	1	1 year	2
3 weeks	1	2 years	2
3 months	1	3 years	1
4 months	3	4 years	1
6 months	1	5 years	2
7 months	1	10 years	1
8 months	1	Doubtful	4

The amount of sputum was considerable in 12 cases, moderate in 5, and very little in 5. The blood pressure for the group averaged 94–123; 2 men were unusually large with blood pressures over 150, which raised the average in such a small number of patients consider-

ably. Leaving out these two high pressures the average was the same as for the nontuberculous group, 91–118.

Physical signs were absent in 1, 12 presented weakened breath sounds, 3 had moist râles, and 5 various dry râles.

All of the 22 were working at the time of examination; comparison of this group with the nontuberculous in the same stage of silicosis fails to show any important points of difference; the symptoms and signs are a little more pronounced.

MINER'S CONSUMPTION, THIRD STAGE.

Number of patients, 68; average age, 37.8; married, 58; single, 10.

AGES, BY 10-YEAR GROUPS.

20 to 29	15
30 to 39	25
40 to 49	19
50 to 59	8
60 to 69	1

AGES, UNDER 21, AT WHICH MINING COMMENCED.

At 10 years	1	At 18 years	4
At 12 years	2	At 19 years	10
At 14 years	4	At 20 years	5
At 15 years	7		
At 16 years	6	Total (60.2 per cent)	41
At 17 years	2		

The average number of years the men in this group had been mining was 15.9, with an average of 8 years in sheet-ground. One had worked in sheet-ground less than 1 year, having probably contracted silicosis before coming to southwestern Missouri, 3 had not worked underground, 2 having done millwork, and 1 having run a hoist. On machine drills in sheet-ground 47 men averaged 6.3 years, and 23 men averaged 5 years shoveling.

Of the 68 men 21 looked sick. Their symptoms were:

Diminished expansion		56
Loss of weight		51
Hemorrhages (20.5 per cent)		15
Night sweats		15
Occasional	10	
Frequent	5	
Dubious history of former night sweats		14
Pain in chest		50
Over one side	14	
Over one base	6	
Over both bases	3	
Over one apex	1	
Over all front	13	
Various	13	

Cough was absent in 3 cases and antedated dyspnea in 8. The duration of dyspnea was:

3 months	1	4 years	8
4 months	2	5 years	2
6 months	3	6 years	2
8 months	1	7 years	1
10 months	3	8 years	2
1 year	13	10 years	1
2 years	19	Doubtful	3
3 years	7		

As mentioned before, the duration of dyspnea is somewhat uncertain and where given in terms of months in this table probably indicates the duration of severe dyspnea; also it was usually impossible to get accurate histories of symptoms dating back several years.

The amount of sputum was unusually large in 5, considerable in 23, moderate in 13, and little or none in 27 cases.

The blood pressures for the group averaged 86–111, 7 points lower than for the second stage and 11 points lower than for the first. The following abnormalities were noted:

High systolic pressure, 150 or over	1
Low systolic pressure, 100 or less	21
High diastolic pressure, 110 or over	2
Low pulse pressure, 20 or less	18

There are 11 duplicates in the last item, leaving 31 abnormal pressures.

Of the 68, 7 had no appreciable physical signs. Abnormal breath sounds were noted as follows:

Weakened breath sounds	14
Weakened breath sounds, with a variety of adventitious sounds	5
Harsh and exaggerated breath sounds	5
Bronchial breathing	4
Bronchial breathing with exaggerated breath sounds	3

Moist râles were noted in 25 cases, as follows:

Scattered over all	3
Over all one side	3
Over front, one side	1
Over apex and upper half other side	3
Over upper half, one side	4
Over upper half, both sides	4
Over upper half, behind	1
Over one base	5
Midscapular region, one side	1

Sonorous and sibilant râles were present in 5.

Of the 68, 46 were working at the time of examination or until within the previous six months.

There were 73 cases of miners' consumption in the third stage with a tuberculous infection. The average age was 36.3; 62 were married and 11 single.

AGES, BY 10-YEAR GROUPS.

20 to 29	15
30 to 39	31
40 to 49	20
50 to 59	7

AGES, UNDER 21, AT WHICH MINING COMMENCED.

At 12 years	1	At 18 years	7
At 13 years	1	At 19 years	6
At 14 years	2	At 20 years	6
At 15 years	4		
At 16 years	3	Total (47.9 per cent)	36
At 17 years	6		

The average number of years that these men had been mining was 14, and the average for sheet-ground mining was 7.7. On machine drills 50 averaged 6 years and 33 averaged 4.2 years shovelling.

Of the 73, 30 appeared sick; symptoms for the group were:

Diminished expansion		65
Loss of weight		59
Hemorrhages (30 per cent)		21
Night sweats		21
Occasional	14	
Frequent	7	
Dubious history of former night sweats		11
Pain in chest		55
Over one side	15	
Over upper half of chest	4	
Over one base	8	
Over both bases	3	
Various	25	

The sputum was unusually large in amount in 16, considerable in 29, and moderate in 18 cases; 9 had very little sputum.

The duration of dyspnea for this group was:

2 months	1	3 years	16
3 months	2	4 years	5
4 months	[illegible]	5 years	3
5 months	1	6 years	1
6 months	4	7 years	1
1 year	13	Doubtful	12
2 years	10		

The blood pressures for the group average 84–109, 2 points lower than for the nontuberculous in the same stage. The following abnormalities were noted:

High systolic pressure, 150 or over	1
Low systolic pressure, 100 or less	23
High diastolic pressure 110 or over	6
Low pulse pressure, 20 or less	28

There were two duplicates in the last item, making a total of 56 abnormal pressures.

Physical signs were noted in this group as follows:

Weakened breath sounds		20
Harsh and exaggerated breath sounds		3
Bronchial breathing		2
Diminished vocal resonance		2
Dry râles of various types		10
Moist râles		31
Over all	2	
Over one side	7	
Over one side and upper half of other	4	
Over one side and front of other	1	
Over one side in front	2	
Over one side behind	1	
Over upper half, one side	3	
Over upper half, behind both sides	1	
Over lower half, both sides	1	
Over lower half, one side	4	
Over one base	1	
Over one base and one side behind	1	
Various patches	3	

It will be noticed that while 63 had sputum in amounts from moderate to very copious, only 31 had moist râles. Of the 73, 48 were working at the time of examination or until within the previous six months.

For comparison the following tables are given, relating to the men who, on examination, were apparently well. There were 179 such (out of 720), the average age being 31.6:

AGES, UNDER 21, AT WHICH MINING COMMENCED.

At 10 years	1	At 17 years	7
At 12 years	4	At 18 years	16
At 13 years	5	At 19 years	9
At 14 years	6	At 20 years	8
At 15 years	13		
At 16 years	12	Total (45.2 per cent)	81

The average number of years these men had mined was 11, while the average for sheet-ground mining was 3.9. Fifty-eight had

worked in sheet-ground less than 1 year, 66 between 1 and 5 years, and 55 men over 5 years, as follows:

5 years	12	11 years	5
6 years	7	12 years	5
7 years	3	13 years	1
8 years	2	14 years	2
9 years	5	15 years	1
10 years	10	16 years	2

The 121 men in the last two groups (those who had worked in sheet-ground more than 1 year) averaged 5.7 years in sheet-ground.

The blood pressures for the well group averaged 95–124, with the following abnormalities:

High systolic pressure ,150 or over	8
Low systolic pressure, 100 or less	2
High diastolic pressure, 110 or over	17
Low pulse pressure, 20 or less	2
	33

SUMMARY OF TABLES.

A summary of the foregoing tables shows a regular progression in the number (percentage) and intensity of both symptoms and signs, from the first stage to the third stage and as between the nontuberculous and the tuberculous in each stage. Attention is called to the average number of years' work in sheet-ground: For the first stage group 5.3, for the second stage group 6.7, and for the third stage group 8 and 7.7, respectively, while the average for the well men was 3.9. Five years' steady work with exposure to flint dust is fairly certain to find the miner in at least the first stage of silicosis; the difference in the degree of dustiness in various mines and the steadiness of work will largely account for individual differences in duration of disease. The figures relative to drilling and shoveling are not very instructive, as the majority of men have done both, often alternating one with the other.

The increasing number of cases with a moderate or large amount of sputum in the second and third stages and the majority of tuberculous infections in the third stage bear witness to the increased tendency to infection that accompanies the progress of a silicosis.

The blood-pressure records show nothing that could be called distinctive of miners' consumption, only a gradual fall accompanying the loss of vitality; the abnormal blood pressures of the well men are nearly all high and those of the sick men mostly low.

The number of miners who commenced to work underground before 21 years of age is noteworthy, more than half in nearly every group. While hard work at an early age necessarily often undermines the vitality, the percentage under 21 among the well men would

indicate that immaturity has little to do with the incidence of miners' consumption, though contributing to the rapidity with which these cases break down.

While the foregoing tables indicate that 60 per cent of those examined had miners' consumption, the actual prevalence of this disease is, of course, less. The total number examined represents about one-fourth of the number of men working in the sheet-ground mines previous to 1915. On this basis 15 per cent of all hard-rock miners in the Joplin district had silicosis, but the writer believes, largely on impressions gained in house-to-house visiting, that the total incidence is at least twice as great. The boom in zinc mining since the start of the European war has resulted in a large number of outsiders coming into the Joplin district, and at present (January, 1916) it is probable that there are more than twice as many miners employed there as formerly, and it is not possible to figure the extent of disease among this number, most of the newcomers being miners from other parts of the country.[1]

ANALYSIS OF FACTS BEARING ON DEATHS.

In a series of house-to-house visits there was obtained a history of 198 deaths from miners' consumption, occurring in 130 families out of a total of 480 families visited. The average age at death of these 198 was 36.7. Their ages, by 10-year groups, were:

20 to 29	52
30 to 39	72
40 to 49	52
50 to 59	18
60 to 69	4

As the only source of information lay in statements of surviving members of the family, no reliable information could be obtained as to the length of illness or duration of disability. Several families gave notable histories: Mrs. C. lost two husbands, aged 32 and 48, one son, aged 28, and one son-in-law, aged 34; Mrs. L. lost four brothers, aged 40, 42, 44, and 40; Mrs. T. lost two brothers, aged 30 and 28, a half brother aged 30, a husband aged 29, and a brother-in-law aged 28. The following table gives a record of 28 cases of miners' consumption who have died since they were examined by the writer:

[1] The Miners' Phthisis Prevention Committee, Union of South Africa, reports (Mar. 15, 1916, p. 14) 26.1 per cent positive cases and 5.5 per cent probable but doubtful in a series of 3,136 examinations of white miners.

Record of 28 cases who died since examination.

Case No.	Age.	Number of years mining.	Number of years in sheet-ground.	Duration of symptoms previous to examination.	Date of examination.	Date of death.	Duration of disability previous to death.	Remarks.
478	35	17	6	1 year.....	Aug. 5,1915	January, 1916.....	5 months..	These 6 cases were in the third stage of miners' consumption when examined.
567	45	16	4	3 years....	Aug. 31,1915	November, 1915...	6 months..	
573	39	17	12	1 year.....	Sept. 4,1915	December, 1915...	11 months.	
654	43	14	9	8 months..	Oct. 5,1915	November, 1915...	7 months..	
684	30	14	7	3 years....	Nov. 22,1915	December, 1915...	11 months.	
715	48	20	11	4 years....	Dec. 9,1915	.....do.....	3 years....	
52	39	16	10	5 years....	May 8,1915	August, 1915.....	.....do....	All these 22 cases were in the third stage of miners' consumption when examined and all had tubercle bacilli in their sputum.
202	42	20	12	3 years....	May 27,1915	July, 1915.....	2 years....	
203	41	8	8	6 years....	.....do.....	August, 1915.....	10 months.	
234	50	17	8	? years....	June 1,1915	September, 1915...	22 months.	
242	40	20	6	3 years....	.....do.....	November, 1915...	2 years....	
272	31	10	10	? years....	June 5,1915	.....do.....	11 months.	
279	50	7	7	.....do....	June 8,1915	July, 1915.....	1 year.....	
285	34	15	10	4 months..	June 9,1915	August, 1915.....	3 months..	
108	25	10	10	3 weeks...	May 15,1915	January, 1916.....	? months[1].	
156	31	13	11	6 months..	May 21,1915	February, 1916....	8 months..	
237	32	12	11	.....do.....	June 1,1915	January, 1916.....	7 months..	
316	25	3	3	2 years....	June 16,1915	March, 1916.....	9 months..	
398	33	15	12	3 months..	July 16,1915	October, 1915.....	6 months..	
411	46	26	9	3 years....	July 20,1916	February, 1916....	14 months.	
519	40	7	7	10 months.	Aug. 16,1915	August, 1915.....	1 year.....	
542	27	14	14	1 year.....	Aug. 25,1915	February, 1916....	4 months..	
556	30	10	10	? years....	Aug. 27,1915	March, 1916.....	6 months..	
566	37	17	8	1 year.....	Aug. 31,1915	December, 1915...	...do.....	
578	40	15	5	2 years....	Sept. 13,1915	January, 1916.....	19 months.	
601	31	10	1½	...do.....	Sept. 16,1915	March, 1916.....	1½ years...	
652	46	7	7	1 year.....	Oct. 16,1915	December, 1915...	2 months..	
713	30	16	13	2½ years...	Dec. 8,1915	.....do.....	1 year.....	

Average age at death..... 37
Average number of years mining..... 13.7
Average number of years sheet-ground..... 8.6
Average number of years disability before death..... 1

[1]Working when examined.

While, as stated before, the record of duration of symptoms is of questionable value, the average of the number of years in sheet-ground, in the foregoing table 8.6, plus the average duration of total disability, 1 year, gives us 9.6 years, which may be taken as the average expectancy of life in a miner with silicosis, dating from the time he commenced hard-rock mining.[1] The figure 8.6 is in accord with the average number of years in sheet-ground for men in the third stage—8 and 7.7. The number of years mining in sheet-ground, as expressed in figures, includes the period of partial disability, as few men, when partially disabled, seek work outside of the mines. We may safely conclude, then, that the average case of miners' consumption dies within 10 years of beginning exposure to silicious dust.

[1] These figures apply to the Joplin district. It is possible that the experience of other mining districts in the United States may differ in this respect.

RELATION OF MINERS' CONSUMPTION TO LIVING CONDITIONS AND TO TUBERCULOUS INFECTION.

While the cause of miners' consumption is found entirely in the underground work of the miners, yet the poor and often wretched conditions under which so many of them live, and the presence of tuberculous foci all combined to reduce their vitality and resistance, on the one hand, and directly to increase their chances of tuberculous infection on the other.

The following quotation from the report of the Miners' Phthisis Committee,[1] is illuminating:

> * * * In 1902–3 a large number of our cases appeared to progress to a fatal issue without clinical or bacteriological evidence of a superadded tuberculous infection. At the present time, however, tuberculosis is certainly found in the large majority of cases in the terminal stage of the disease. There has, undoubtedly, since the date mentioned, been a distinctive alteration in the predominant clinical type of the disease.

We have no data of the status of affairs in the earlier days of mining in southwestern Missouri, but it is reasonable to suppose that there has been a similar progress of events there. In other words, as the country has become more and more settled, and as foci of tuberculous infection have become more widespread, the chances for any given case of miners' consumption to remain uninfected is less and less; at present, owing largely to the unhygienic living conditions and the carelessness of the miners themselves, we have the results set forth in the tables above, namely, a preponderance of tuberculous infection in the third stage, and with such infection almost inevitable before death.

As far as housing is concerned, the danger lies in the crowding and intimate contact of members of the family. Small three and four room shacks are very common; and aside from any question of ventilation or hygienic precautions on the part of the tuberculous, such intimate contact is sufficient to insure the spread of tuberculous infection among both the miners and their children.

There has not been observed among the women in miners' families much tuberculous infection which could be charged to infection among the men. Missouri was included in the registration area too recently for its vital statistics to be of much value on such a point, but the general opinion of doctors, nurses, and others who come into contact with the people is as stated. While this opinion probably underestimates the real condition of affairs, the short period during which many cases of miners' consumption emit tubercle bacilli before their death would seem to explain this apparent lack of infection of the wives. However, this danger, while it may be

[1] Union of South Africa, Capetown, 1912, p. 8, par. 10.

minimal for adults, is a serious matter as far as children are concerned. In order to arrive at some idea of the amount of tuberculous infection among children, an examination of school children, to the number of 2,506, was made in the town of X, in the sheet-ground district. Attention was paid to those under weight or too slender for their height or otherwise undersized. The following table shows the results:

Ages.	Number.	Under size or weight.	Per cent.
Under 10:			
Boys, miners	299	38	12.7
Boys, nonminers	317	49	15.4
Girls, miners	274	25	9.1
Girls, nonminers	297	18	.6
10 to 15:			
Boys, miners	272	72	26.4
Boys, nonminers	239	52	21.7
Girls, miners	221	25	11.3
Girls, nonminers	333	34	10.2
Over 15:			
Boys, miners	23	4	17.3
Boys, nonminers	83	4	4.8
Girls, miners	31	1	3.2
Girls, nonminers	117	1	.8

For comparison, the children were divided into those of miners' families and those of nonminers' families. It was possible to secure only 64 of the above for thorough physical examination; this showed 14 of the 64 to be tuberculous and 10 probably tuberculous; these 24 were almost all miners' children, and in the majority of cases the father had suffered from miners' consumption or had possibly died of it.

While these data may not indicate very much tuberculous infection of miners' children, yet we can logically expect, unless precautions are taken, that tuberculous infection will become more and more menacing to public health in the Joplin district. This implies increased danger to adults and to children, with tuberculous infection in miners' consumption occurring more frequently in the first and second stages and earlier in the third stage, and consequently directly affecting the safety of the children.

There becomes apparent, therefore, as a matter of paramount importance to the welfare of the community, a necessity of educating the miner to guard against the possible spread of infection, and of controlling children by medical inspection in the schools and by adequate visiting-nurse service, with facilities for examining children, especially of known consumptive parents. As the writer has had occasion to point out elsewhere, miners' consumption should be treated with the same hygienic precautions as is pulmonary tuberculosis, as there is no telling in any given case when infection may take place and tubercle bacilli appear in the sputum.

CONCLUSIONS.

1. Miners' consumption is an important occupational disease, widely prevalent among the hard-rock miners of the Joplin district, affecting probably 30 to 35 per cent of them.

2. Miners' consumption is essentially a pneumonoconiosis, due to the inhalation of silicious rock dust, and resulting in a fibrosis, with loss of function.

3. The disability and other effects of miners' consumption are due primarily to silicosis, infection being usually a secondary, and often a terminal, process.

4. Infection, both tuberculous and pyogenic, is common in miners' consumption, the tendency to infection increasing as the disease progresses.

5. The incidence of tubercle infection in miners' consumption is a menace to the public health, affording an unusual opportunity for the spread of tuberculosis.

6. Aside from the hygienic supervision of working conditions underground, education of the miner against the spread of infection and supervision of miners' children, especially those of consumptive parents, are matters of vital importance.

ROENTGEN-RAY FINDINGS IN MINERS' CONSUMPTION, BASED UPON A STUDY OF 150 CASES.

By Samuel B. Childs, M. D.

The larger number of the roentgenograms upon which this study is based were made by Dr. Dumbauld, of Webb City, Mo. They were made with the patient supine, at the end of a full inspiration, and the anodal distance from the plates was 25 to 30 inches. These plates were brought to Denver by Dr. Lanza, who requested the writer's assistance in their interpretation. The remainder of the roentgenograms are from the writer's collection, and in this series the patient's position was prone, the other conditions being the same as those just mentioned. In the majority of cases the stereoscopic method was employed.

The writer expresses his appreciation to Dr. Lanza and Dr. Dumbauld for the opportunity of studying so many cases of miners' consumption, especially those in a comparatively early stage. The reproductions in this article have been selected to represent the progressive changes in the course of this disease. In the reproduction of a chest roentgenogram, many of the finer deposits and secondary lung changes are often not shown clearly, although they are easily detected upon the original negative, hence the description of each reproduction in this article is taken from the original negative.

In an article by Dr. Sewall, of Denver, in conjunction with the writer, which appeared in the Archives of Internal Medicine for July, 1912, an attempt was made to interpret the shadows found upon a roentgenogram of both the normal and tuberculous chest, based upon a study of 100 consecutive cases. Added experience has tended to confirm the correctness of the aforesaid interpretations, so that it does not seem necessary, in this study, to explain in detail the cause of the ordinarily accepted chest shadows. We shall endeavor to mention the changes in the cases under our observation which denote the earliest deviation from the normal shadows caused by the inspiration of rock, coal, or metal dust, and to trace the course of the disease in its several stages, contrasting these changes with those found in similar stages of tuberculosis.

As tuberculosis is ordinarily divided into three stages, it seems best arbitrarily to divide miners' consumption into three stages for the sake of comparison.

FIRST STAGE.

The changes that are regarded as characteristic of the first stage of miner's consumption are the secondary changes in the shadow cast by the root of each lung and that cast by the radiating branches of the bronchial tree, and are caused by the fibrosis which is established as the result of continued irritation of the bronchi from the inspiration of dust particles encountered in mine work.

These changes are represented by increased density and breadth of the shadow of the walls of the bronchi of each lung and by the shadows of numerous punctate deposits of varying size in the line of the thick-walled bronchi. The root shadows are more voluminous and denser than normal and frequently contain the still denser shadows of nodular deposits. This pathological process is very often symmetrical in both lungs and closely resembles the peribronchial thickening found in the bronchial type of tuberculosis. In fact, without the aid of a clinical history the writer believes that it is practically impossible, in many cases, from the roentgenograms alone to distinguish between the early peribronchial fibrosis of miner's consumption and that caused by bilateral bronchial tuberculosis. Certain points of difference sufficient to differentiate the two diseases, however, are often observed upon the roentgenogram.

In bronchial tuberculosis we find more "stippling" or fine deposits in the extreme apices than in miners' consumption, and the shadows cast by a few calcareous nodules, possibly by only one, in some part of the lung, in addition to the fibrosis, are mute evidence of the scars of a healed tuberculous focus, and are sufficient often to distinguish the two diseases. As a rule in bronchial tuberculosis there is not the extensive symmetrical fibrosis nor the dense bronchial wall shadows that are characteristic of the first stage of miner's consumption. In bronchial tuberculosis the amount of fibrosis is often more extensive in one lung than in the other, as shown by the difference in density and breadth of the bronchial wall shadows, indicating that the less dense shadows probably denote a more recent infection or one in which the preparative fibrosis is only partially established.

In bronchial tuberculosis attacks of pleurisy are not infrequent and we can often demonstrate on the roentgenogram patches of thickened pleura or pleuritic bands which, in addition to the fibrosis, exert a sufficient pull to displace the trachea or the heart from their normal position, or occasion a restricted or delayed range of motion to one side of the diaphragm. In the early stage of miner's consumption, on the contrary, we have been unable to demonstrate any appreciable displacement of the trachea or heart or notice any difference on the excursion of the diaphragm on either side.

SECOND STAGE.

In addition to the fibrosis above described, which exists in the first stage, there is distributed throughout each lung in a fairly symmetrical manner, both as to size and location, a large number of circumscribed dense areas in which the miners' dust has found lodgment. As the disease advances, there accumulates in certain portions of each lung larger masses of deposits than in others, and there seems to be no general rule applicable to all cases for the location of these large deposits, a fact which apparently is determined by some idiosyncrasy or local lessened resistance peculiar to the individual. The most frequent site that we have observed for these large deposits, however, is in the lower part of the upper third of each lung, about the level of the root shadow, nearly equidistant from back and chest wall and vertically midway of chest. On the other hand, no part of the lung seems to be exempt from these massive deposits, but the upper half of each lung is the most frequently involved; occasionally the arrangement of the fibrosis and deposits is not symmetrical in both lungs, but every case in our series shows bilateral involvement, and the pathological shadows in one lung are practically of the same density as those in the other, indicating that the inception of the pathology probably occurred at or about the same period of time in each lung.

In the second stage of tuberculosis the symmetrical arrangement of dense masses in each lung in the location just described is rarely found, and the masses when present in either lung do not have as well defined an outline, being generally either partially or wholly obscured by the shadow of thickened pleura, adhesive bands, or irregularly distributed bands of fibrosis, and in this stage there frequently is evidence of beginning cavity formation. The heart and trachea are generally both displaced and the excursion of the diaphragm is limited, whereas, in miners' consumption in the second stage, cavitation practically never occurs unless a tuberculous infection has already become established; the outline of the large deposits is more sharply defined and is either of uniform density or of greatest central density, diminishing in intensity to the periphery, the heart and trachea are not displaced and the dome of the diaphragm appears accentuated, due to the increased depth of the external angle between the diaphragm and chest wall.

THIRD STAGE.

The appearance of the third stage of miner's consumption differs very little from that of the second stage, except in the greater extent of lung involvement, as indicated by an increased number of deposits and more massive grouping of the circumscribed areas of

dense shadows, often to such an extent that it is impossible to find any portion of the area of the involved lung that appears free from the shadows which characterize the final stage of the disease. The position of the heart shows but slight if any deviation from the normal. The angle between the diaphragm and chest wall is deepened markedly in inspiration, and the domelike appearance of the diaphragm is still more accentuated than in the second stage.

The diminished rib spacing in the middle third of the chest upon a full inspiration, which begins to be apparent in the second stage, is still narrower in the third stage, while the spacings between the lower ribs are increased.

Cavity and abscess formation are not infrequently detected in the third stage, but this condition is regarded as the result of an engrafted tuberculous or pyogenic infection. When this change has taken place we find evidence of adhesive bands, heart and tracheal displacement, restricted motion of the diaphragm, in fact many of the typical appearances that are characteristic of the third stage of tuberculosis.

In the third stage of tuberculosis cavitation can practically always be detected and the changes in the lungs are characterized by areas of varying density, interpreted as indicating the difference between the old and more recent areas of involvement, and the secondary changes incident thereto. In this stage marked heart and tracheal displacement are apparent with limited movement of the diaphragm.

The heart in miner's consumption casts a larger shadow than normal, and in the early stages is probably caused by its increased musculature from heavy work. The shadow of the heart remains larger than normal in the second and also in the third stage. In tuberculosis, on the contrary, the heart shadow is smaller than normal, especially in the second and third stages.

Fig. 1.—First stage silicosis; hard rock miner off and on for 15 years. Comparatively small amount of fibrosis and general absence of deposits with the exception of those in the right root.

Fig. 2.—First stage silicosis; coal miner 2 years, hard rock 4 years. Bilateral fibrosis with deposits in each lung along lines of radiation. Hardly any sputum, but tubercle bacilli appeared in sputum soon after plate was made.

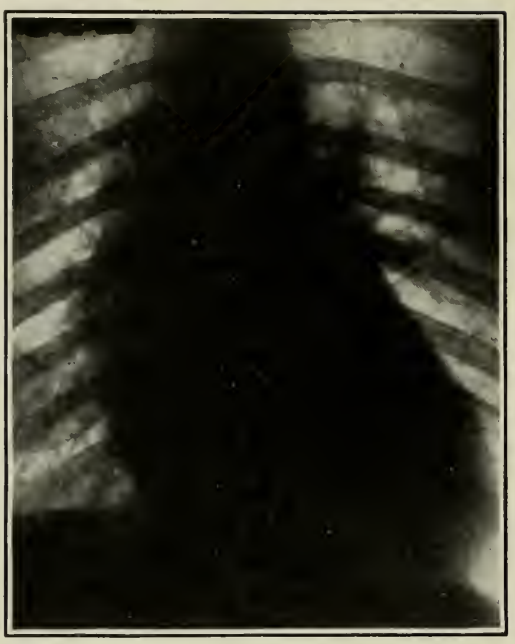

Fig. 3.—No. 59, first stage silicosis. Shadows relatively larger than normal, bringing out the bronchial fibrosis which exists bilaterally. Thickening and deposits at left root. No tuberculosis.

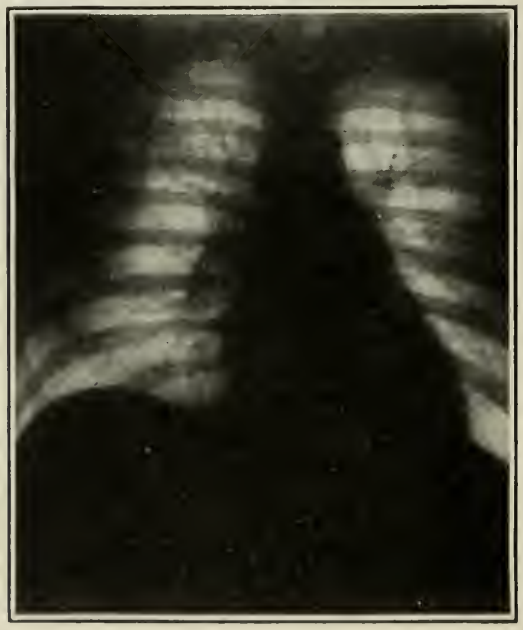

Fig. 4.—First stage silicosis. Bronchial fibrosis with thickening about right root; also accentuated dome right diaphragm. Sputum scanty.

Fig. 5.—First stage silicosis; hard rock miner 9 years. More extensive fibrosis and deposits on right than left, but in the latter the thickening about root is more apparent. No evidence of cavitation. Tubercle bacilli present in sputum.

Fig. 6.—Second stage silicosis; hard rock miner 16 years. Note extensive fibrosis with small deposits lower half each lung; also diminished spacing of ribs on right side. No tuberculosis demonstrable clinically.

Fig. 7.—Second stage silicosis; hard rock miner for 4 years. Bronchial fibrosis with discrete deposits in each lung. Note dense shadow of left root. No tuberculosis demonstrable clinically.

Fig. 8.—Second stage silicosis; hard rock miner for 20 years off and on. Characteristic bilateral arrangement of shadows cast by deposits. Very little sputum and no tuberculosis demonstrable clinically.

Fig. 9.—Second stage silicosis; this case was a millman who had never worked underground, but had worked in a mill (crusher house) for 25 years. Large deposits about root of each lung; note typical appearance of diaphragm on full inspiration. Sputum scanty, and no tuberculosis demonstrable clinically.

Fig. 10.—Second stage silicosis; hard rock miner 11 years. Symmetrical shadows in each lung, with thickening about each root. Very little sputum and no tuberculosis demonstrable clinically.

Fig. 11.—Third stage silicosis; hard rock miner for 18 years. Extensive large masses about midway of chest in upper third each lung, also other deposits distributed in lower half right lung and middle third of left. Evidence of cavitation right apex. Considerable sputum with tubercle bacilli present.

Fig. 12.—Third stage silicosis; hard rock miner 25 years off and on. Note extensive massive deposits in each lung; also adhesions of diaphragm. This man was the picture of robust health and had practically no symptoms aside from severe dyspnea. Was in sanatorium 6 months, where no tuberculosis could be demonstrated.

Fig. 13.—Third stage silicosis; hard rock miner for 20 years. Note extensive deposits throughout each lung, with two large circumscribed deposits just above root of each lung. Had coughed for 5 years, no tuberculosis demonstrable clinically.

Fig. 14.—Advanced third stage silicosis, without cavitation; hard rock miner for 13 years. Note extensive massive deposits occupying more than half of each lung. Note characteristic appearance of diaphragm found with this extensive amount of involvement; also increased spacing lower ribs with diminished spacing of upper.

Fig. 15.—Third stage silicosis, with tuberculosis; hard rock miner for 16 years. Extensive deposits upper half of each lung with cavitation; adhesive pleuritic bands accounting for the cone-shaped elevation of the diaphragm; diminished spacing of the ribs in mid-chest.

Fig. 16.—This is a case of anthracosis in a miner who had worked 18 years in coal mines. Extensive bilateral deposits throughout each lung, and marked thickening about each root.

APPENDIX.

CASES TYPICAL OF THE VARIOUS GROUPS OF MINERS' CONSUMPTION.

The following cases are selected as being typical of the various groups to which they belong:

No. 522, age 36, single, mining for 10 years, in sheet ground 7 years, machineman 4 years and shoveler 3; previous history negative. Appearance healthy, weight 146, normal; has been coughing off and on for 5 years and has had dyspnea for 2 years, moderate; no hemorrhages, no night sweats, no chest pains; expansion diminished. Pulse 72, blood pressure 90–120; a good deal of sputum at present. Examination reveals nothing, the chest appears clear. Diagnosis—miner's consumption, first stage.

No. 83, age 30, mining for 6 years, all in sheet ground, shoveling all the time; pneumonia 9 years ago. Appearance healthy, weight 150, normal; is moderately dyspneic for past year with only an occasional cough; no hemorrhages, no night sweats, pain in chest at left base; expansion diminished. Pulse 76, blood pressure 96–130; a little sputum at times. Examination shows weakened breath sounds all over chest, nothing else. Diagnosis—miner's consumption, first stage. Examined 7 months later, weight 155, cough and dyspnea somewhat increased. Was working steadily all the time, averaging about fifty 1,250-pound cans of ore a day—a first-class shoveler.

No. 173, age 33, mining for 10 years, 5 years in sheet ground on machine; typhoid 7 years ago. Appearance healthy, weight 165, normal; has been dyspneic for 2 years, now moderate, and has been coughing for a year, loses his breakfast; no hemorrhages, no night sweats, pain all over back of chest, expansion diminished. Pulse 68, blood pressure 80–122; a little sputum at times. Examination shows diminished vocal resonance right apex, both apices being impaired on percussion. Diagnosis—miner's consumption, first stage.

The sputum of these three cases was negative for tubercle bacilli.

No. 266, age 27, mining 12 years, off and on, 4 years in sheet ground on machine; diphtheria 7 years ago, grippe 3 weeks ago; appearance healthy, weight 145, normal; has been slightly dyspneic for several years, has been coughing since the grippe; no hemorrhages, no night sweats, pain over left side chest, expansion diminished. Pulse 80, blood pressure 100–120. Examination, chest slightly impaired on percussion over all, expansion greater right; breath sounds weakened behind on right; breath sounds almost inaudible upper half, left side, behind, with vocal resonance hardly perceptible over same area. A little sputum at times, but positive for tubercle bacilli. Diagnosis—miner's consumption, first stage, with a tubercle infection. This man was the picture of health, working hard all the time; his "grippe," 3 weeks ago, probably marked the activation of a tubercle infection in the dust-injured lungs.

No. 289, age 29, mining for 5 years at irregular intervals; in sheet ground 5 years, on machine 2; typhoid 17 years ago. Appearance healthy, weight 165, normal; has been moderately dyspneic for 9 months, no cough; no hemorrhages,

no night sweats, various pains in chest; expansion diminished; pulse 72, blood pressure 92–116; very little sputum at any time, but positive for tubercle bacilli. Examination reveals nothing. Diagnosis—miners' consumption, first stage, with a tubercle infection. Examined 3 months later. Had been ill; weight went down to 149, but now 162. Has had a little morning cough, dyspnea about same; spit a little blood twice. Is working steadily.

Tubercle infection in these two cases is probably recent; the small amount of sputum would indicate no mixed infection, which would account for their comparatively good condition. The after progress of these cases is not known.

No. 600, age 38, mining 22 years, 9 years in sheet ground, on machine 7, and shoveling 2; pneumonia as a child. Appearance healthy, weight 164, should weigh 180; has been dyspneic for 15 months, now moderately severe, and has been coughing off and on for 1 year; no hemorrhages; no night sweats; pains over front of chest; expansion diminished. Pulse 72 blood pressure 100–120; a good deal of sputum. Examination reveals nothing. Diagnosis—miners' consumption, second stage. This man laid off a while and then went back to work underground, driving a mule. A temperature record over 5 days failed to show any rise of temperature in the evening.

No. 524, age 25, mining for 7 years, all sheet ground, machine 3 years, and shoveling 4; pneumonia 11 years ago. Appearance healthy, weighs 150, should weigh 165; has been dyspneic for at least 7 months, now severe; has had a morning cough for 3 months, and loses his breakfast; no hemorrhages; no night sweats; pains over front of chest; expansion diminished. Pulse 68, blood pressure 100–130; a moderate amount of sputum, negative for tubercle bacilli, but showing flint dust. Examination shows breath sounds weak over all, especially behind. Diagnosis—miners' consumption, second stage. This man used to shovel about seventy-five 1,000-pound cans of ore daily, can now shovel only 35 or 40. He got a lighter job underground, and 2 months after examination there was a slight improvement in symptoms. A temperature record taken 4 months after examination failed to show any rise of temperature in the evening.

No. 656, age 38, mining 16 years, 7 years in sheet ground, mostly on machine drills; previous history, negative. Appearance healthy, weight 135, should weigh 145; has been dyspneic for 10 years, now moderately severe, and has been coughing off and on for 8 years; no hemorrhages; no night sweats; pain over left side of chest formerly; expansion diminished. Pulse 84, blood pressure 86–128; a small amount of blue sputum. Examination shows retraction of the apices, with weakened breath sounds over all, especially upper half behind; vocal resonance is diminished over all. Diagnosis—miners' consumption, second stage. This man had not worked underground for 9 years but around mine engine rooms and running mine hoists; he stated that from year to year his dyspnea was increasing and his weight decreasing. Was seen 2 months after examination running mine hoist and feeling well, except for his dyspnea. A temperature record at this time failed to show any rise of temperature in the evening.

No. 399, age 40, had been working 15 years in mills of sheet-ground mines; typhoid at 18. Appearance healthy, weight 170, about normal; has been dyspneic for a year and a half, now severe, and has been coughing slightly for same time; no hemorrhages; no night sweats; various pains in the chest; expansion diminished. Pulse 72, blood pressure 70–94; very little sputum. Examination shows apices dull on percussion, with weakened breath sounds

behind on the right side and over all on the left. Diagnosis—miners' consumption, second stage. This man quit work a year previous and went to the State tuberculosis sanitarium. While there, never had any elevation of temperature, nor were tubercle bacilli ever found in his sputum, over a stay of 7 months. An example of miners' consumption contracted outside of underground work.

No. 135, age 34, mining for 24 years, 11 years in sheet ground; machine man all the time; typhoid and pneumonia as a child. Appearance healthy, weight 125, should weigh 150; dyspnea for the past 5 years, now moderate, and cough for 5 years, mostly in the morning; no hemorrhages; no night sweats; no chest pains; expansion diminished. Pulse 72, blood pressure 66–96; very little sputum at any time. Examination showed squeaky râles over front, right side, with greatly weakened breath sounds same side behind; breath sounds are weak left side behind and absent over left base. Diagnosis—miners' consumption, second stage. This man was working up to the time of his examination and was in the habit of vomiting his breakfast.

No. 479, age 25, mining for 10 years, 7 years in sheet ground, 3 on machine, and 4 shoveling; previous history negative. Appearance healthy, weight 145, should weigh 160; dyspneic for the past 5 years, now moderately severe; has coughed for 3 years; loses breakfast; no hemorrhages; no night sweats; pains over front of chest; expansion diminished. Pulse 84, blood pressure 82–114, a considerable amount of sputum, negative for tubercle bacilli. Examination shows weakened breath sounds over the right side. Diagnosis—miners' consumption, second stage. Four months later was still working, temperature record showing no evening temperature, but obviously going down hill. (All temperatures were taken between hours 4 and 5 p. m. in all cases.)

No. 571, age 27, mining 12 years, 8 years in sheet ground; previous history negative. Appearance healthy, weight 170, normal; has been dyspneic for past 3 years, now moderate, and has coughed off and on for 3 years; had several hemorrhages, quantity unknown, about 6 months ago; has night sweats more or less frequently, no chest pains; expansion diminished. Pulse 64, blood pressure 80–108; a considerable amount of sputum. Examination shows weakened breath sounds all over chest. Diagnosis—miners' consumption, second stage. While the night sweats and large amount of sputum point to infection in this case, there were no moist râles.

No. 623, age 43, mining for 20 years, off and on, and 12 years in sheet ground; typhoid 23 years ago. Appearance healthy, though thin; weight 122; should weigh 165, the loss having occurred in 2 years' time; has had dyspnea for a year and a half, now severe; no cough; 8 small hemorrhages in the past year; no night sweats; pain over front of chest; expansion diminished. Pulse 84, blood pressure 98–120; a moderate amount of sputum, negative for tubercle bacilli. Examination shows roughened breath sounds at right apex and weakened breath sounds upper third, behind, on left side. Diagnosis—miners' consumption, second stage. Is working steadily all the time.

No. 14, age 29, mining 12 years, 2 years in sheet ground (had done hard-rock mining elsewhere); previous history negative. Appearance healthy, weight 163, about normal; has been dyspneic for 5 years, now severe, and has been coughing for 3 years; no hemorrhages; no night sweats (dubious history of night sweats a year ago); various pains in chest; expansion diminished. Pulse 94, blood pressure 90–128; a small amount of sputum, positive for tubercle bacilli. Examination shows apices and bases impaired on percussion and weakened breath sounds over both bases, behind. Diagnosis—miners' consumption, second stage, with a tubercle infection. Condition apparently unchanged 7 months later, working all the time. This man has had 2 wives die of pulmonary tuberculosis and his present wife has tuberculosis.

No. 132, age 38, mining for 8 years, all sheet ground, on machine and shoveling about half the time; typhoid 15 years ago. Appearance healthy, weight 145, normal; has been dyspneic for an indefinite time, severe for 4 months; has been coughing for a year and a half; loses breakfast; no hemorrhages; no chest pains; a few night sweats 2 months ago; expansion diminished. Pulse 80, blood pressure 92–122; a considerable amount of sputum, positive for tubercle bacilli. Examination shows moderately coarse moist râles, on cough, left base, behind, with diminished vocal resonance same area. Diagnosis—miners' consumption, second stage, with a tubercle infection.

No. 639, age 21, mining 4 years, all sheet ground, on machine 2 years and shoveling 2 years; smallpox 7 years ago. Appearance healthy, weight 120, normal 135; dypsneic for an indefinite time, severe for 4 months, now urgent; coughing for 3 months, now severe; no hemorrhages; occasional night sweats (frequent 9 months ago); pain over front of chest; expansion diminished. Pulse 88, blood pressure 100–128; very little sputum. Examination shows dull apex, left, with expansion better, right side. Breath sounds are weak upper half of chest, especially right side, behind. Diagnosis—miners' consumption, third stage. Six months ago this man was shoveling forty-five 1,250-pound cans of ore a day. Was seen 3 months after examination, still working, but hardly able to get around; is driving mule. Temperature record at this time fails to show any elevation above normal.

No. 557, age 48, mining 16 years, 2½ years in sheet ground; has had malaria. Appearance thin, weight 125, should weigh 150; has been dyspneic for 4 years, increasing all the time and now severe; very little cough; no hemorrhages; no night sweats; no chest pains; diminished expansion. Pulse 84, blood pressure 76–90; very little sputum. Examination shows right apex dull and expansion better left. On the right side, bronchial breathing apex and weakened breath sounds over all; left side, loud sonorous râles all over front, bronchial breathing upper half behind. Diagnosis—miners' consumption, third stage. This man has been idle 4 years; he feels well, looks well, eats and sleeps well, but is so dyspneic on exertion he is unable to do any work. Temperature record does not show any elevation.

No. 96, age 64, mining for 29 years, 9 years in sheet ground, shoveling; previous history negative. Appearance healthy, weight 150, should weigh 170; dyspnea duration uncertain; severe for 2 years, and now urgent; severe cough for 2 years; no hemorrhages; no night sweats; pain right base; diminished expansion. Pulse 120, blood pressure 68–86; a large amount of sputum, negative for tubercle bacilli. Examination shows chest dull on percussion, upper half and impaired remainder; right side, coarse moist râles, increased on cough, upper third, harsh breath sounds remainder; left side, coarse moist râles apex, harsh breath sounds remainder. Diagnosis—miners' consumption, third stage. Has been unable to work for 2 years and is very sick. Was seen 4 months after examination, dyspnea worse and is going down hill. Temperature record shows slight elevation (2/10) occasionally.

No. 72, age 28, mining for 8 years, all sheet ground, and on machine half the time; pneumonia 5 months ago. Appearance healthy; weight 126, should weigh 145; dyspnea, severe, for past year; coughs occasionally, no hemorrhages; night sweats formerly; various pains in chest; diminished expansion. Pulse 100, blood pressure 74–118, very little sputum, negative for tubercle bacilli. Examination shows left apex impaired on percussion; some fine moist râles, on cough, right apex; bronchial breathing, whispered pectoriloquy left apex, moist râles of midscapular left side. Diagnosis—miner's consumption, third stage. Examined 3 months later; weight 120, no cough, dyspnea increased, is having night sweats; is working steadily in spite of his severe dyspnea; 7 months after

examination has a lighter job, is feeling somewhat better; temperature record at this time shows no elevation.

No. 713, age 30, mining 16 years, in sheet ground 13 years, mostly machine drilling; smallpox 2 years ago. Appearance sick, weight 126, should weigh 145; has been dyspneic for 2 years, now urgent; coughing for 2½ years, now severe; no hemorrhages, no night sweats, no chest pains; diminished expansion. Pulse 128, blood pressure 64–82; a considerable amount of slaty-blue sputum, positive for tubercle bacilli. Examination shows a large variety of adventitious sounds, groans, wheezes, rattles, and whistling noises all over chest. Diagnosis—miner's consumption, third stage, with a tubercle infection. Patient has not worked for a year; died 8 days after examination.

No. 519, age 40, mining for 7 years, all sheet ground, on machine 3 years; pneumonia 20 years ago and 1 year ago. Appearance sick, weight 118, should weigh 138; has been dyspneic a long time, severe for past 8 months; has had a moderate cough for 10 months; no night sweats, no hemorrhages, no pain in chest; expansion diminished. Pulse 112, blood pressure 70–90; a large amount of blue sputum, positive for tubercle bacilli. Examination shows chest dull on percussion, upper half and impaired remainder; moist râles and squeaks all over right side; amphoric breathing left apex, coarse moist râles over left front. Diagnosis—miner's consumption, third stage, with tubercle infection. Patient had been unable to work for 1 year and died 2 weeks after examination.

No. 258, age 23, mining 8 years, all sheet ground and on machine; typhoid 7 years ago. Appearance healthy, weight 167, normal; has been dyspneic 3 years, now severe; has had an evening cough for 7 months; frequent night sweats, lately; no hemorrhages; pain over left side of chest; diminished expansion. Pulse 88, blood pressure 84–110; a moderate amount of sputum positive for tubercle bacilli. Examination shows slight impairment on percussion over all chest; breath sounds are inaudible upper half behind, both sides, and very weak lower half; vocal resonance almost inaudible behind, except over bases. Diagnosis—miner's consumption, third stage, with tubercle infection. Patient quit work 2 months ago, but has since resumed.

No. 492, age 37, mining 12 years, 7 years in sheet ground, 5 years on machine and 2 years shoveling; previous history negative. Appearance healthy, weight 121, should weigh 135; dyspneic for 8 or 10 years, moderately severe past 4 years; has had a severe morning cough for 9 months; no hemorrhages, no night sweats, no chest pains; diminished expansion. Pulse 96, blood pressure 110–132; a considerable amount of blue sputum, positive for tubercle bacilli. Examination shows cavernous breathing and clicking râles right apex; bronchial breathing left apex, moist râles scattered over left side. Diagnosis—miner's consumption, third stage, with tubercle infection. This man had not worked underground for 8 years, following the carpenter's trade, yet he was still expectorating blue sputum, and his dyspnea was increasing from year to year. He died of pulmonary hemorrhage 9 days after being examined.

No. 361, age 35, mining 11 years, all machine work in sheet ground; malaria 2 years ago. Appearance healthy, weight 175, should weigh 200; has been dyspneic for 2 years, now severe, and has coughed for 2 years, now severe in the morning; night sweats 2 years ago, no hemorrhages, various pains in chest; diminished expansion. Pulse 120, blood pressure 90–114; moderate amount of sputum, positive for tubercle bacilli. Examination shows dull apex, right side, and impaired over all; expansion better left; breath sounds somewhat weak, left side. Diagnosis—miner's consumption, third stage, with tubercle infection. Quit work 2 months ago.

RELATED PUBLICATIONS.

[Literature bearing upon the subject of vocational diseases issued by the Public Health Service, from which copies may be obtained without charge.]

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